Manitoba/Manitoba Hydro

Coordinated Aquatic Monitoring Pilot Program (CAMPP):

Three Year Summary Report (2008-2010) - Volume 4

Results of the Three Year Program

Section 5.3: Upper Churchill River Region

VOLUME 4

SECTION 5.3: UPPER CHURCHILL RIVER REGION

Reference listing:

Coordinated Aquatic Monitoring Program (CAMP). 2014. Three Year Summary Report (2008-2010). Report prepared for the Manitoba/Manitoba Hydro MOU Working Group by North/South Consultants Inc., Winnipeg, MB.

TABLE OF CONTENTS

Page 5.3-x

LIST OF TABLES

LIST OF FIGURES

Page 5.3-x

Page 5.3-x

Page 5.3-x

Page 5.3-x

Page 5.3-x

Page 5.3-x

Page 5.3-x

Page 5.3-x

Page 5.3-x

Page 5.3-x

Page 5.3-x

Page 5.3-x

5.3 UPPER CHURCHILL RIVER REGION

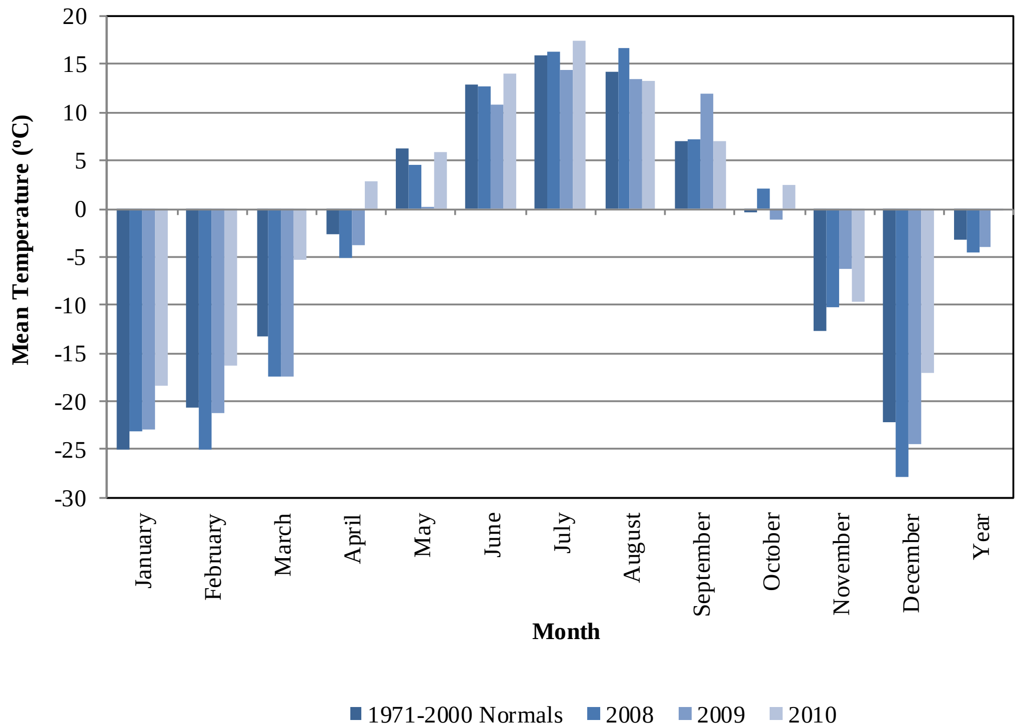
The following presents the results of the Coordinated Aquatic Monitoring Pilot Program (CAMPP) conducted over the period of 2008/2009 through 2010/2011 in the Upper Churchill River Region.

5.3.1 Climate

The mean annual temperature measured at Lynn Lake in 2008 and 2009 was similar to, and in 2010 was slightly higher than, the 1971-2000 mean annual temperature normal (Figure 5.3.1-1). Temperatures were notably warmer in December 2008, November 2009, and January, March, and December 2010 than monthly temperature normals.

Annual precipitation was slightly higher in 2008 and 2009 and slightly lower in 2010 compared to the normal for Lynn Lake (Figure 5.3.1-1). For the period of June through September, the months in which open-water season monitoring occurred under CAMPP, June and September were drier than normal in 2008, 2009, and 2010, July and August 2008 and 2009 were notably wetter than normal, and July and August 2010 were similar to the monthly normals. Precipitation peaked in July 2008 and 2009 at 125 mm and 117 mm, respectively, and in August 2010 at 74 mm.

(A)



(B)

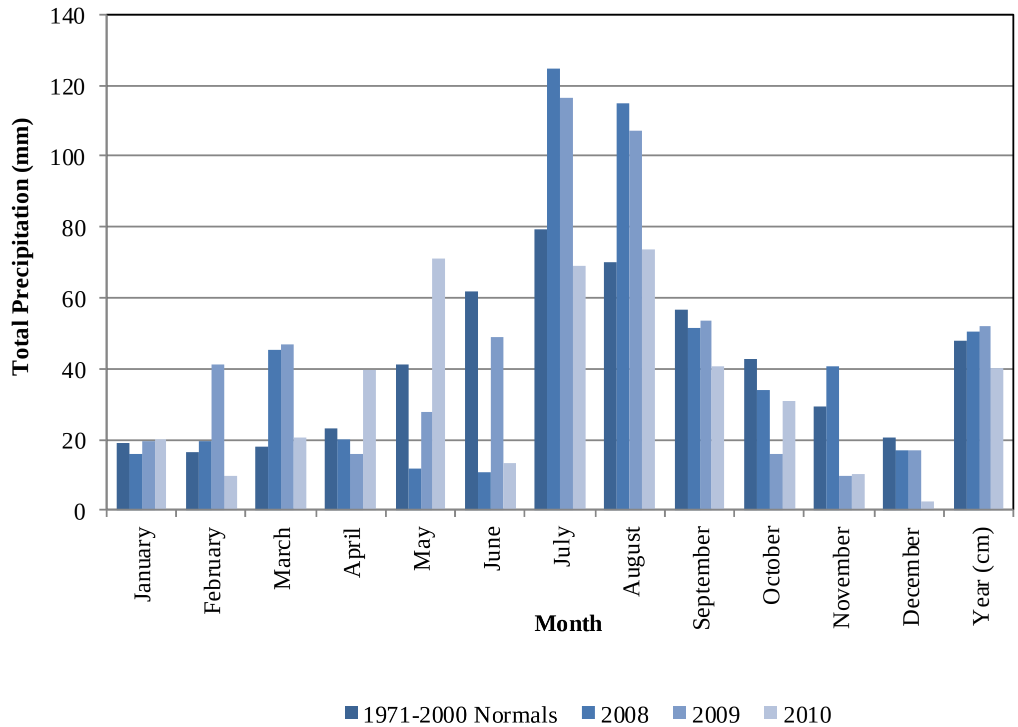


Figure 5.3.1-1. Monthly (A) mean air temperature and (B) monthly total precipitation for 2008-2010 compared to climate normals (1971-2000), Lynn Lake, MB.

5.3.2 Hydrology

Upper Churchill River flows entering Manitoba are influenced by run-off from snow-melt and precipitation across the Churchill River drainage basin, which begins in Alberta and covers a large portion of northwestern Saskatchewan. The drainage basin includes several large lakes which act as reservoirs, the largest being Reindeer Lake along the Manitoba-Saskatchewan border. Between 2008 and 2010, CAMPP monitoring occurred on Southern Indian Lake, which acts as a hydroelectric reservoir for Manitoba Hydro as part of the Churchill River Diversion (CRD). Monitoring also occurred on Granville Lake as the off-system waterbody for this region. Flows for the upper Churchill River Region are reported based on a gauge at Granville Falls upstream from Granville Lake.

Upper Churchill River flow in 2008 and 2009 was close to average from January into May before climbing to peaks well above the upper quartile in each year due to above average snowpack. Below average rainfall in 2008 led to flows back down to near average levels to complete the year however in 2009 flows remained above the upper quartile through the end of the year due to above average precipitation. In 2010, flow started out above the upper quartile and dropped below average in mid-May due to a below average snowpack and then remained near the lower quartile until mid-August. Flows then increased but remained below average for the rest of the year (Figure 5.3.2-1). In early 2011, flows were close to average from January through March.

Southern Indian Lake water levels tend to follow a predictable pattern each year, rising with the spring freshet, peaking in late summer/fall, and declining steadily through the winter. Water levels generally followed this typical trend in 2008 and 2009, with the exception that levels remained relatively high through the end of 2009. Water levels in 2010 did not follow the typical trend and remained at or above the upper quartile for most of the year, reaching record highs from early-February through late April (Figure 5.3.2-2). In early 2011, water levels were slightly above average from January through March.

Granville Lake water levels followed a similar trend as the upper Churchill River flows in 2008, 2009, and 2010. In 2008 and 2009, water levels were slightly above average from January to May before climbing above the upper quartile in the summer. Levels dropped back down to near average to complete the year in 2008, but remained well above the upper quartile throughout the rest of 2009. Granville Lake water levels were well above the upper quartile for the first few months of 2010 before declining to the lower quartile by August and returning to near average levels from October through the end of the year (Figure 5.3.2-3). In early 2011, water levels were close to or just above average from January through March.

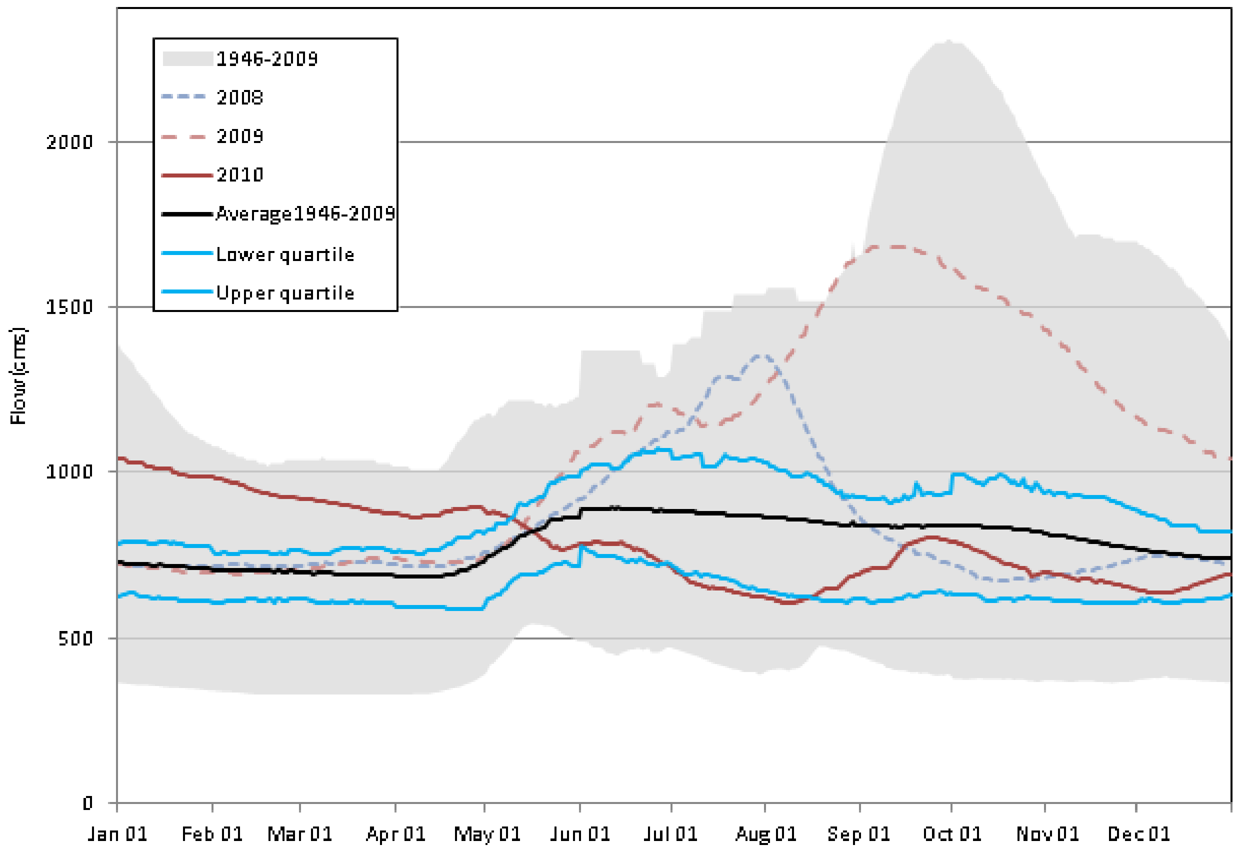


Figure 5.3.2-1. 2008-2010 upper Churchill River flow at Granville Falls (06EC006).

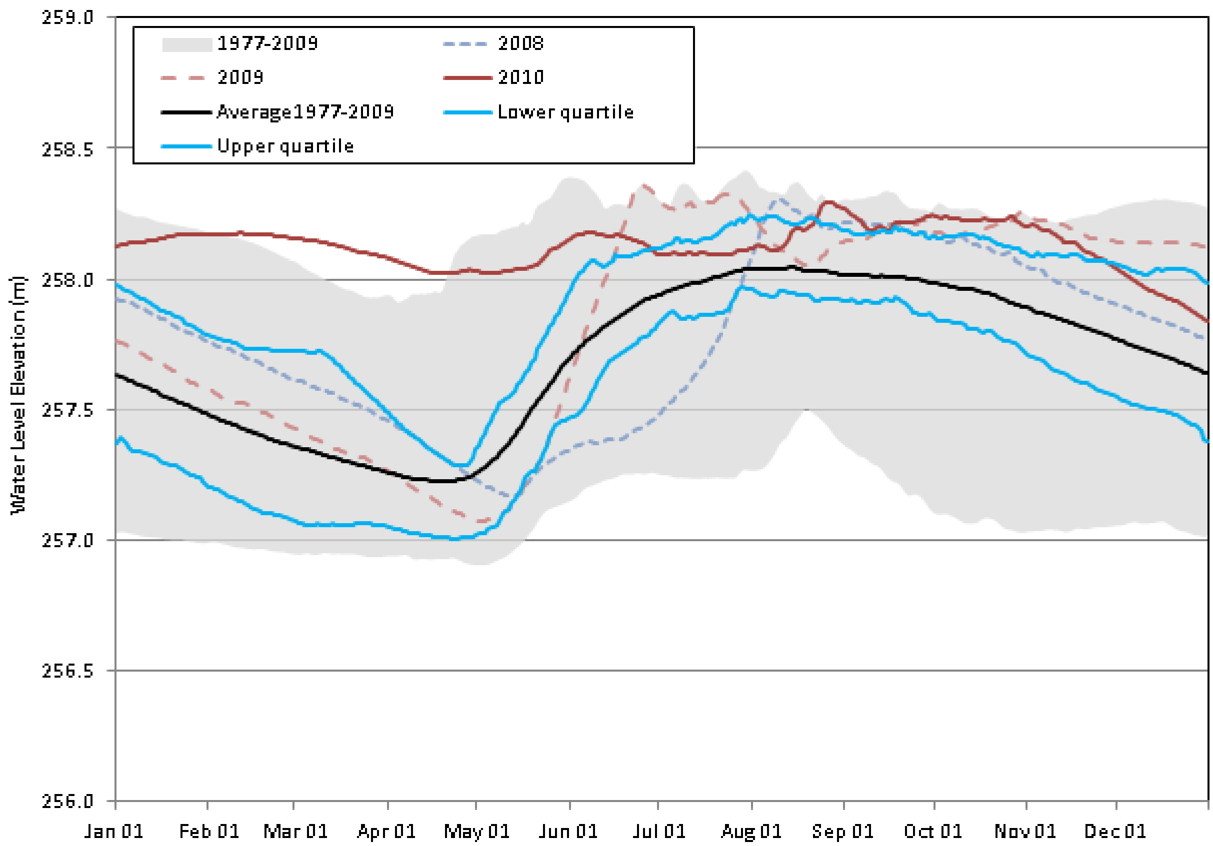


Figure 5.3.2-2. 2008-2010 Southern Indian Lake average water level elevation.

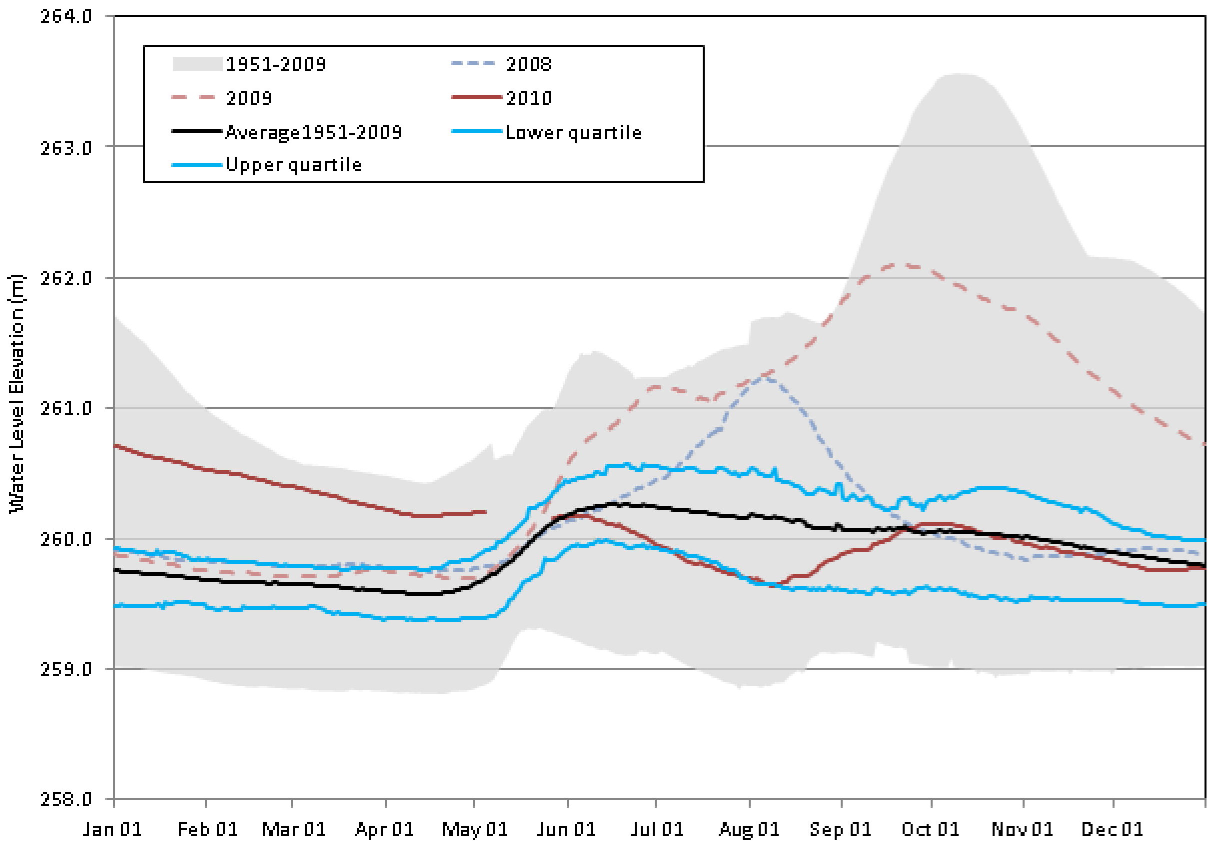


Figure 5.3.2-3. 2008-2010 Granville Lake (06EB002) water level elevation.

5.3.3 Aquatic Habitat

Aquatic habitat surveys were not conducted in the Upper Churchill River Region in years 1 to 3 of CAMPP.

5.3.4 Water Quality

The following provides an overview of water quality conditions measured over the three years of CAMPP in the Upper Churchill River Region. Waterbodies sampled annually included Southern Indian Lake-Area 4 (near Missi Falls; SIL-Area 4) and Granville Lake (an off-system lake) at a site located approximately 200 km upstream of the Missi Falls Control Structure (CS). While the off-system Gauer Lake, an off-system lake sampled annually, is formally included in the Lower Churchill River Region, water quality data collected from this waterbody were also included in the analysis of Upper Churchill River Region information. Water quality was also measured at two rotational sites: Southern Indian Lake-Area 1 (SIL-Area 1) in 2009/2010; and at Southern Indian Lake-Area 6 (SIL-Area 6) in 2010/2011 (Figure 5.3.4-1). Sampling times relative to air temperature are presented in Figure 5.3.4-2.

Water quality is described below for on-system waterbodies located on the upper Churchill River and off-system waterbodies (Granville and Gauer lakes), including results of statistical analyses conducted to evaluate seasonal variation, spatial differences, and temporal (i.e., interannual) differences. Water quality is also characterized through comparisons to Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs) for the protection of aquatic life (PAL) to evaluate overall ecosystem health (Manitoba Water Stewardship [MWS] 2011).

Several water quality parameters frequently vary seasonally in north-temperate freshwater ecosystems, most notably between the open-water and the ice-cover seasons, in relation to changes in water temperature, biological productivity (e.g., algal abundance), and differences in physical conditions such as the presence of ice or variability in tributaries or inflows over the year. For example, concentrations of the inorganic forms of nitrogen which are readily used by primary producers are typically higher in winter due to relatively lower algal abundance. Dissolved oxygen (DO) concentrations also vary with water temperature as warmer water holds less oxygen than colder water and because ice cover may reduce or eliminate atmospheric re-aeration of surface waters. It is of interest to identify seasonal variability as it may affect aquatic biota and because it is important to consider when assessing differences or changes in water quality conditions over time.

The primary objective of spatial comparisons (i.e., comparison between waterbodies) was to evaluate whether water quality conditions differ between sites on the upper Churchill River as water flows from Granville Lake (an off-system waterbody located upstream of the effects of Manitoba Hydro’s hydraulic system) downstream to the Missi Falls CS. Comparisons were also made between waterbodies lying directly on the upper Churchill River including the on-system sampling sites (SIL-Areas 1, 4 and 6) and the off-system Granville and Gauer lakes. Water quality would be expected to differ between waterbodies located along the upper Churchill River and waterbodies located in the same general region but within separate catchments due to fundamental, inherent differences associated with the watersheds and waterbodies. The objective of the comparisons between the on- and off-system waterbodies was to formally identify differences between these areas to assist with interpretation of results of CAMP as the program continues.

Temporal comparisons were undertaken for each waterbody sampled annually in order to provide a preliminary assessment of temporal variability. As additional data are acquired, more formal trend analyses will be undertaken to evaluate potential longer-term changes.

Results of water quality monitoring conducted under CAMPP in the Upper Churchill River Region were also compared to MWQSOGs for PAL to provide a snap-shot assessment of ecosystem health. These comparisons are not intended to identify cause associated with a water quality variable being outside of the MWQSOGs. In addition, as these comparisons were restricted to the three years of data collected under CAMPP, they do not address historical conditions in the waterbodies.

5.3.4.1 Overview

Water quality in Southern Indian Lake (SIL-Areas 1, 4, and 6) can be generally described as moderately nutrient-rich, slightly alkaline, soft to moderately soft, and well-oxygenated with low to very low water clarity. Southern Indian Lake stratifies during some years but, in 2008/2009 to 2010/2011, maintained DO concentrations above the MWQSOGs for PAL (MWS 2011). On average, SIL-Area 1 and SIL-Area 6 are classified as meso-eutrophic on the basis of open-water total phosphorus (TP) concentrations whereas SIL-Area 4 is classified as mesotrophic. SIL-Area 1 is ranked as mesotrophic, but the other two sites in the lake ranked as oligotrophic, on the basis of mean chlorophyll *a*. On the basis of total nitrogen (TN) concentrations, all three sites ranked as oligotrophic.

Most routine water quality parameters (e.g., ammonia) and metals were within the MWQSOGs for PAL in study areas in Southern Indian Lake. Exceptions included pH (*in situ*), TP, aluminum, iron, lead, and selenium. TP concentrations exceeded the Manitoba narrative nutrient guideline in 50% of the samples collected at SIL-Area 1 and SIL-Area 6 but only 8% of samples from SIL-Area 4. The frequency of exceedance of the metal guidelines was also generally higher at SIL-Area 1 and SIL-Area 6 than SIL-Area 4. However, few differences in water quality were observed between the three areas in Southern Indian Lake.

Water quality of Granville and Gauer lakes (the off-system lakes), while similar to the Southern Indian Lake in some respects, exhibit some notable differences. The off-system lakes weakly stratified on occasion but Granville Lake was well-oxygenated throughout the water column during all seasons; DO in Gauer Lake was depleted at depth during some seasons and concentrations sometimes dropped below the MWQSOGs for PAL. Granville and Gauer lakes are generally clearer and have slightly lower TP concentrations than Southern Indian Lake. Conversely, Gauer Lake is more nitrogen-rich than either Granville or Southern Indian lakes. Trophic status of the off-system lakes based on TP concentrations (mesotrophic) was similar to Southern Indian Lake but was higher (mesotrophic) than the on-system lake based on chlorophyll *a* and TN.

While some routine parameters and metals were highest in Gauer Lake and lowest in Granville Lake (and moderate at SIL-Area 4), the pattern was reversed for a few metals. Differences in water quality between the on- and off-system waterbodies are not unexpected due to inherent differences in the lakes' drainage basins, morphometries, and hydrological conditions.

Few seasonal differences were identified in SIL-Area 4 but several water quality variables in Granville and Gauer lakes exhibited differences between one or more sampling seasons; the most notable pattern occurred in Gauer Lake when comparing open-water sampling periods to the winter period. As is commonly observed in north temperate freshwater ecosystems that experience extensive ice cover, total dissolved solids (TDS) were higher in winter than in other seasons in Gauer Lake. Some metals were also higher in winter in Gauer Lake relative to the open-water season. Similarly, nitrate/nitrite (a form of nitrogen readily taken up by algae) and organic nitrogen in SIL-Area 4 were higher in winter compared to the open-water season. These seasonal differences likely reflect lower primary productivity and use of micronutrients under lower light and temperature conditions experienced under ice.

There were few and inconsistent differences in water quality conditions between the three sampling years within the annual waterbodies, indicating that water quality conditions in the Upper Churchill River Region remained generally stable during the monitoring program and/or temporal differences were not large enough to be detected statistically. This lack of interannual differences is notable in light of the relatively large range of flow conditions observed in the upper Churchill and Gauer rivers over the period of 2008-2010 (see Section 5.3.2 for a discussion of hydrological conditions). Future evaluations of temporal variability or trends will be undertaken when additional data are acquired for the region.

5.3.4.2 Limnology and In Situ Variables

Water temperatures were generally near zero degrees Celsius in the ice-cover season and ranged up to approximately 21 ^{o}C over the study period in waterbodies of the Upper Churchill River Region. The annual mean air temperatures at Lynn Lake were similar to the 1971-2000 normal in

2008 and 2009 and above normal in 2010 (Figure 5.3.1-1). Air temperature was notably above normal in September 2009, which was reflected in the relatively high water temperatures measured in the Upper Churchill River Region during that period.

Upper Churchill River

SIL-Area 4 was thermally stratified in spring and summer in 2008/2009 (note: *in situ* data were not collected from this site in fall 2008) but did not stratify during 2009/2010 or 2010/2011 (Figure 5.3.4-3). SIL-Area 1 did not thermally stratify during the period of study (2009/2010; Figure 5.3.4-4) and SIL-Area 6 only exhibited thermal stratification in spring 2010 (Figure 5.3.4-5).

DO was generally similar across depth in Southern Indian Lake (Figures 5.3.4-6 to 5.3.4-8). The exception occurred in Area 4 in winter 2008/2009 when concentrations decreased across depth (Figure 5.3.4-8). However, DO concentrations were consistently above the most stringent MWQSOGs for the protection of cool-water and cold-water aquatic life across depth in Southern Indian Lake at all times and locations sampled.

Specific conductance (Figures 5.3.4-9 to 5.3.4-11) and turbidity (Figures 5.3.4-12 to 5.3.4-14) were also generally similar across depth in Southern Indian Lake. pH (Figures 5.3.4-15 to 5.3.4-17) tended to vary across depth in the lake, though the trend (increasing or decreasing with depth) was not consistent.

In situ pH measurements from SIL-Area 1 in winter 2009/2010 were below the lower range of the PAL guideline (6.5 pH units), and *in situ* pH near the surface at SIL-Area 4 in fall 2009 and across depth in summer 2010 exceeded the upper range of the PAL guideline (9.0 pH units; Figures 5.3.4-15 and 5.3.4-17). However, as discussed in Section 5.3.4.3, laboratory pH was consistently within the PAL guideline range and varied little at these and other sites in the region suggesting that these *in situ* measurements may reflect meter error.

Secchi disk depths varied between sites in Southern Indian Lake (Figures 5.3.4-18 to 5.3.4-20). At SIL-Area 1 and SIL-Area 6, Secchi disk depths ranged between 0.5 and 1.8 m in the open-water season, but SIL-4 was clearer with Secchi disk depths ranging between 0.7 to 2.8 m. Based on the Swedish Environmental Protection Agency (Swedish EPA 2000) classification schemes for lakes, SIL-Areas 1 and 6 have very low water clarity on average whereas Area 4 has low water clarity.

Off-system Waterbodies: Granville and Gauer Lakes

Granville and Gauer lakes both exhibited weak thermal stratification in the upper 2 m of water in spring 2008 but were isothermal during the other sampling periods (Figures 5.3.4-21 and 5.3.4-22). Although temperature in Gauer Lake was slightly higher at depth in winter in comparison to surface waters, thermal stratification did not develop in the three winters over which monitoring was conducted.

DO did not decrease with depth during the aforementioned periods of stratification; however, vertical differences (i.e., a decrease with depth) developed at both sites in winter 2008/2009, and in summer 2008 and winter 2009/2010 at Gauer Lake (Figure 5.3.4-23 and 5.3.4-24). Unlike waterbodies on the upper Churchill River system, DO concentrations dropped below the most stringent MWQSOGs for the protection of cool-water and cold-water aquatic life (5.5 and 9.5 mg/L, respectively) at a depth of 4 m from the water surface in Gauer Lake in winter 2008/2009. However, no exceedances of the guidelines were found during any other period sampled between 2008/2009 and 2010/2011 for either Granville or Gauer lakes.

As observed in Southern Indian Lake, other *in situ* variables were also relatively similar across depth at Granville and Gauer lakes, including specific conductance (Figures 5.3.4-25 and 5.3.4-26) and turbidity (Figures 5.3.4-27 and 5.3.4-28). pH occasionally increased or decreased with depth (Figures 5.3.4-29 and 5.3.4-30), as observed at Southern Indian Lake. One and two *in situ* measurements of surface pH from Granville and Gauer lakes, respectively, did not meet the MWQSOG for protection of aquatic life (6.5-9.0); the measurement from Gauer Lake in spring 2009 was below the lower limit whereas the readings from Granville and Gauer in summer 2010 both exceeded the upper limit. However, as discussed in Section 5.3.4.3, laboratory pH was consistently within the PAL guideline range and varied little at these and other sites in the region suggesting that these *in situ* measurements may reflect meter error.

Secchi disk depth in Granville Lake was, on average (1.42 m; Figure 5.3.4-31), similar to SIL-Area 4 but was higher in Gauer Lake (1.98 m; Figure 5.3.4-32). Both off-system lakes have low water clarity according to the Swedish EPA (2000) classification schemes for lakes.

Seasonal Differences

Of the *in situ* water quality variables measured under CAMPP in the Upper Churchill River Region, oxidation-reduction potential (Figure 5.3.4-33), pH (Figure 5.3.4-34), and turbidity (Figure 5.3.4-35) did not differ significantly across the sampling seasons in Granville Lake, SIL-Area 4, or Gauer Lake. DO in SIL-Area 4 and Gauer Lake was significantly higher in winter compared to at least one other season (Figure 5.3.4-36) and although not statistically significant, DO concentrations were also highest in winter in Granville Lake. It is common for DO concentrations to be highest in winter due to the higher inherent capacity of water to hold more oxygen at lower water temperatures.

Spatial Comparisons

Only one statistically significant difference was observed between the two annual waterbodies located on the upper Churchill River system (i.e., SIL-Area 4 and Granville Lake) indicating that, based on available data, water quality did not differ notably between sites separated by approximately 200 km. The significant difference occurred for specific conductance, which was lower in Granville Lake in comparison to SIL-Area 4 (Figure 5.3.4-37).

Only two water quality variables differed significantly between the annual sites on the upper Churchill River system and Gauer Lake (i.e., off-system waterbody), including specific conductance (Figure 5.3.4-37) and *in situ* turbidity (Figure 5.3.4-38). Conductance was higher and turbidity was lower in Gauer Lake compared to SIL-Area 4 and Granville Lake.

Statistical analyses did not incorporate SIL-Area 1 or SIL-Area 6 due to limited data (i.e., only one year of data), but there were no clear differences evident from a qualitative examination of the data. Statistical differences will be re-assessed in the future when additional data are acquired for these waterbodies.

Temporal Comparisons

SIL-Area 4 had significantly higher specific conductance (Figure 5.3.4-39) in 2008 compared to 2010, while turbidity was statistically lower in 2008 than 2010 (Figure 5.3.4-40). In contrast, none of the *in situ* water quality variables monitored in Gauer or Granville lakes were statistically different between sampling years. Future evaluations of temporal variability or trends will be undertaken when additional data are acquired for the region.

5.3.4.3 Routine Laboratory Variables

Routine laboratory variables described below include nutrients, such as nitrogen and phosphorus, pH, alkalinity, TDS/conductivity, total suspended solids (TSS), turbidity, and true colour.

Upper Churchill River

All measurements of ammonia (MWQSOGs vary with pH and temperature) and nitrate/nitrite (MWQSOG: 2.93 mg N/L) were within MWQSOGs for PAL at all sites and sampling times in Southern Indian Lake. All laboratory measurements of pH were within the PAL guidelines (6.5-9.0) but, as previously mentioned, some exceedances of the PAL guideline occurred based on *in* *situ* measurements of pH. Half of the samples collected at SIL-Area1 and SIL-Area 6 exceeded the Manitoba narrative guideline for TP for lakes, reservoirs and ponds but a lower frequency of exceedance (8%) occurred at SIL-Area 4 (Figure 5.3.4-41). Acid sensitivity of the three areas in Southern Indian Lake is classified as least based on pH and moderate based on TDS (Table 5.3.4-1). In terms of total alkalinity and calcium concentrations, sensitivity of SIL-Area 1 is low and moderate, respectively, but SIL-Area 6 and SIL-Area 4 are less sensitive and are classified as least and low, respectively.

In Southern Indian Lake, dissolved phosphorus (DP) generally comprised a greater fraction of TP than the particulate form (Figure 5.3.4-42) whereas TN was dominated by organic nitrogen (Figure 5.3.4-43). Of the dissolved inorganic nitrogen (DIN) pool, nitrate/nitrate was present in slightly higher concentrations than ammonia. Molar TN:TP ratios indicate that each area of Southern Indian Lake was phosphorus limited during most sampling events (Figure 5.3.4-44).

The water sample collected at depth (1 m above the sediment-water interface) in SIL-Area 4 during thermal stratification in summer 2008 indicates that DIN, nitrate/nitrite, TN, and DP were similar in surface and bottom samples but that TP and total particulate phosphorus (TPP) concentrations were higher at depth than near the surface (Figures 5.3.4-45 and 5.3.4-46). Bottom samples were not collected in SIL-Area 4 during the other periods of stratification.

Off-system Waterbodies: Granville and Gauer Lakes

Like the Southern Indian Lake sites, ammonia and nitrate/nitrite concentrations in Granville and Gauer lakes were within MWQSOGs for PAL and acid sensitivity ranged from least to moderate (Table 5.3.4-1). All laboratory measurements of pH were also within the PAL guidelines (6.5-9.0); however, the *in situ* measurements from Granville and Gauer lakes in summer 2010 were above the upper guideline. Exceedance of the narrative Manitoba guideline for TP occurred (17% of samples) in both lakes, and the frequency of exceedance was lower than SIL-Areas 1 and 6 but higher than at SIL-Area 4 (Figure 5.3.4-41).

The composition of total nitrogen and phosphorus in Granville and Gauer lakes was also relatively similar to that observed in the on-system waterbody. Like Southern Indian Lake, TN was dominated by organic nitrogen (Figure 5.3.4-43), nitrate/nitrite was present in higher concentrations than ammonia, and TN:TP ratios indicate phosphorus limitation with occasional periods of co-limitation (Figure 5.3.4-44). In contrast, particulate phosphorus contributed slightly more to the TP concentrations at Granville and Gauer lakes compared to the areas in Southern Indian Lake (Figure 5.3.4-42). Bottom samples were not collected in Granville or Gauer lakes during periods of stratification.

Seasonal Variability

Most routine parameters measured in SIL-Area 4 were similar between seasons while a number of parameters varied seasonally in Granville and Gauer lakes. Many of the seasonal differences were related to the ice-cover season, although the seasonality was not always consistent between the two waterbodies. Nitrate/nitrite concentrations in SIL-Area 4 and Granville Lake were higher in winter compared to other seasons (Figure 5.3.4-47), and organic nitrogen in SIL-Area 4 was also significantly higher in winter than spring (Figure 5.3.4-48). Seasonal patterns unique to Granville Lake included significantly lower concentrations of the following parameters in winter compared to at least one other season: total particulate phosphorus (Figure 5.3.4-49); laboratory pH (Figure 5.3.4-50); and laboratory turbidity (Figure 5.3.4-51). At Gauer Lake, total and bicarbonate alkalinity (Figures 5.3.4-52 and 5.3.4-53), total inorganic carbon (TIC; Figure 5.3.4-54), TDS (Figure 5.3.4-55), and laboratory conductivity (Figure 5.3.4-56) were higher in winter than other seasons. Water quality commonly varies between the ice-cover and open-water seasons in aquatic ecosystems due to differences in hydrology, drainage basin influences, temperature, light, and productivity as well as the physical effects of ice cover (e.g., trapping of gases, lack of re-aeration, and absence of wind effects).

Spatial Comparisons

Unlike the *in situ* parameters, a number of statistically significant differences were observed for a number of routine laboratory water quality parameters between the two annual waterbodies located on the upper Churchill River (i.e., SIL-Area 4 and Granville Lake). TIC (Figure 5.3.4-57), TDS (Figure 5.3.4-58), laboratory conductivity (Figure 5.3.4-59), laboratory pH (Figure 5.3.4-60), and total and bicarbonate alkalinity (Figures 5.3.4-61 and 5.3.4-62) were all higher in SIL-Area 4 than in Granville Lake.

A number of water quality variables differed significantly between the annual sites on the upper Churchill River and Gauer Lake. Variables that were significantly higher in Gauer Lake than SIL-Area 4 and/or Granville Lake include: total and bicarbonate alkalinity (Figures 5.3.4-61 and 5.3.4-62); total Kjeldahl nitrogen (Figure 5.3.4-63); dissolved organic carbon (DOC; Figure 5.3.4-64); TIC (Figure 5.3.4-57); total organic carbon (Figure 5.3.4-65); TDS (Figure 5.3.4-58); and, laboratory measurements of pH (Figure 5.3.4-60), and conductivity (Figure 5.3.4-59). In contrast, laboratory turbidity was significantly lower in Gauer Lake than in SIL-Area 4 or Granville Lake (Figure 5.3.4-66). As previously discussed, differences in water quality between waterbodies in different drainage basins would be expected due to inherent differences in the drainage basin characteristics, lake morphometries, and hydrological conditions.

While statistical analyses did not incorporate SIL-Area 1 and SIL-Area 6 due to limited data, TIC (Figure 5.3.4-57), TDS (Figure 5.3.4-58), laboratory conductivity (Figure 5.3.4-59), laboratory pH (Figure 5.3.4-60), and total and bicarbonate alkalinity (Figures 5.3.4-61 and 5.3.4-62) were also slightly higher in SIL-Area 4 than the other areas and true colour was lower SIL-Area 6 than SIL-Area 1 (Figure 5.3.4-67). Statistical differences will be re-assessed in the future when additional data are acquired for these areas.

Temporal Comparisons

Statistical comparisons between sampling years for annual waterbodies revealed few significant differences. Differences observed for routine laboratory variables were restricted to the following: total alkalinity, bicarbonate alkalinity, and TIC were higher in 2008 than 2010 at SIL-Area 4 (Figures 5.3.4-68 to 5.3.4-70); TP was higher in 2010 than 2008 at SIL-Area 4 (Figure 5.3.4-71); and, DOC was lower in 2008 than 2010 at Gauer Lake (Figure 5.3.4-72). No significant differences were noted for Granville Lake.

The lack of consistent year-to-year differences indicates that water quality conditions in the Upper Churchill River Region remained generally stable during the monitoring program and/or temporal differences were not large enough to be detected statistically. This lack of interannual differences is notable in light of the relatively large range of flow conditions observed in the upper Churchill and Gauer rivers over the period of 2008-2010 (see Section 5.3.2 for a discussion of hydrological conditions). Future evaluations of temporal variability or trends will be undertaken when additional data are acquired for the region.

5.3.4.4 Trophic Status

Upper Churchill River

On average, SIL-Area 1 and SIL-Area 6 are all classified as meso-eutrophic on the basis of TP concentrations (open-water means) whereas SIL-Area 4 is classified as mesotrophic (Table 5.3.4-2). Application of trophic categorization schemes for lakes based on chlorophyll *a* yield different results (Table 5.3.4-3); SIL-Area 4 and SIL-Area 6 would be classified as oligotrophic whereas Area 1 would be classified as mesotrophic on the basis of mean concentrations of chlorophyll *a*. All areas of Southern Indian Lake ranked as oligotrophic on the basis of mean open-water TN (Table 5.3.4-4). Neither TP nor TN were significantly correlated to chlorophyll *a* in Southern Indian Lake Area 4 (Figure 5.3.4-73), which may reflect the relatively limited data and/or that other factors (e.g., light) are more limiting to phytoplankton.

Off-system Waterbodies: Granville and Gauer Lakes

Based on TP, on average the trophic status of Granville and Gauer lakes is mesotrophic to meso-eutrophic and is thus similar to the classification for Southern Indian Lake (Table 5.3.4-2). However, application of trophic categorization schemes for lakes based on chlorophyll *a* indicates that the off-system waterbodies are mesotrophic and on average more productive than on-system ones (Table 5.3.4-3). Gauer Lake also contains more nitrogen than Southern Indian Lake and ranked as mesotrophic on the basis of mean TN (Table 5.3.4-4). Trophic status of Granville Lake based on mean open-water TN was oligotrophic, similar to other areas on the upper Churchill River. Like Southern Indian Lake, neither TP nor TN were significantly correlated to chlorophyll *a* in either Granville or Gauer lakes (Figures 5.3.4-74 and 5.3.4-75). However, TP was marginally correlated to chlorophyll *a* in Granville Lake at a significance level of 0.1.

5.3.4.5 *Escherichia coli*

Upper Churchill River

E. coli was not detected in SIL-Area 1 or SIL-Area 4 over the study period but was detected in 25% of samples collected from SIL-Area 6 (Table 5.3.4-5). The concentration in the detected sample from SIL-Area 6 was at the analytical detection limit (1 colony forming units [CFU]/100 mL); therefore, all measurements were well below the Manitoba water quality objective for primary recreation of 200 CFU/100 mL.

Off-system Waterbodies: Granville and Gauer Lakes

E. coli was detected in 17% of samples from each Granville and Gauer lakes with detected concentrations ranging from 1 to 3 CFU/100 mL (Table 5.3.4-5). As such, all measurements were well below the Manitoba water quality objective for primary recreation of 200 CFU/100 mL.

5.3.4.6 Metals and Major Ions

Upper Churchill River

The dominant cation in Southern Indian Lake is calcium, followed by magnesium (Figure 5.3.4-76). Hardness measurements indicate that waters are soft to moderately soft (Figure 5.3.4-77). Chloride concentrations were relatively low across the areas in Southern Indian Lake (i.e., < 1.5 mg/L; Figure 5.3.4-78) and well below the Canadian Council of Ministers of the Environment (CCME) PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 8.5 mg/L, averaged less than 3.8 mg/L across sites, and fell on the lower range of concentrations reported across Canada (Canadian Council of Resource and Environment Ministers [CCREM] 1987) . While there is currently no Manitoba or CCME PAL guideline for sulphate, concentrations were consistently below the British Columbia Ministry of Environment (BCMOE) guidelines which range from 128 to 429 mg/L for waters ranging from soft to very hard (Meays and Nordin 2013).

Of the 38 metals/metalloids measured in Southern Indian Lake, only nine were never detected (antimony, beryllium, bismuth, mercury, silver, tellurium, thallium, tungsten, and zinc; Table 5.3.4-6). Metals that were consistently detected at all sites and times included: aluminum; barium; calcium; iron; magnesium; manganese; potassium; rubidium; sodium; strontium; thorium; and titanium. The remaining metals were detected at varying frequencies, although boron, cadmium, cesium, molybdenum, nickel, and selenium were detected in less than 30% of surface samples at each site.

Most metals were present in concentrations below the MWQSOGs for PAL at all sites and sampling times in Southern Indian Lake; the exceptions included aluminum, iron, lead, and selenium (Table 5.3.4-7). All samples collected at SIL-Area 1 and SIL-Area 6 exceeded the PAL guideline of 0.1 mg/L for aluminum, as did the majority (>83%) from SIL-Area 4 (Figure 5.3.4-79). Like aluminum, a greater number of iron samples exceeded the PAL guideline (0.3 mg/L) in SIL-Area 1 (50%) and SIL-Area 6 (75%) compared to SIL-Area 4 (8%; Figure 5.3.4-80). Samples collected in spring and summer 2009 from SIL-Area 1 also had lead concentrations in excess of the site-specific MWQSOG for PAL (0.00077-0.00081 mg/L). Three samples collected in SIL-Area 4 contained selenium concentrations at or marginally above the analytical detection limit (DL) which is also equivalent to the PAL guideline (0.001 mg/L). However, measurements that are at or near analytical DLs are associated with relatively high uncertainty and there is low confidence that an actual exceedance of a PAL guideline has occurred when the measurement is at or near the DL.

As was observed for phosphorus, concentrations of total aluminum, iron, and manganese were higher in samples collected near the sediment-water interface relative to surface grabs in SIL-Area 4 in summer 2008 (Figure 5.3.4-81), when the lake was thermally stratified (Figure 5.3.4-3). The bottom sample contained an aluminum concentration above the MWQSOG PAL (0.1 mg/L), but all other metals were within PAL objectives or guidelines.

The analytical detection limits for mercury varied over the study period and were typically above the current MWQSOG PAL guideline (0.000026 mg/L). Therefore comparison of analytical results to the PAL guideline could not be undertaken for all samples. Considering only the results of analyses where the analytical DL was sufficiently low to facilitate this comparison, all measurements from Southern Indian Lake were below the current MWQSOG PAL.

Off-system Waterbodies: Granville and Gauer Lakes

Like Southern Indian Lake, the dominant cation in Granville and Gauer lakes is calcium, followed by magnesium (Figure 5.3.4-76). Hardness measurements indicate that waters in Granville Lake are soft while Gauer Lake is moderately soft (Figure 5.3.4-77). Also like Southern Indian Lake, chloride concentrations were relatively low in Granville and Gauer lakes (i.e., < 1.7 mg/L; Figure 5.3.4-78) and were well below the CCME PAL guideline of 120 mg/L for a long-term exposure (CCME 1999; updated to 2013). Sulphate concentrations were consistently less than 11 mg/L, averaged less than 3.8 mg/L across sites (Figure 5.3.4-78), fell on the lower range of concentrations reported across Canada (CCREM 1987), and were well below the BCMOE PAL guidelines (Meays and Nordin 2013)

Of the 38 metals/metalloids measured in Granville and Gauer lakes, only eight were never detected (beryllium, bismuth, cesium, mercury, silver, tellurium, thallium, and thorium; Table 5.3.4-6). Metals that were consistently detected at both sites and all times included: aluminum; barium; calcium; magnesium; manganese; potassium; rubidium; silicon; sodium; and strontium. The remaining metals were detected at varying frequencies, although antimony, arsenic, boron, chromium, cobalt, lead, molybdenum, nickel, selenium, tungsten, zinc, and zirconium were detected in less than 30% of surface samples in each waterbody.

All metals were present in concentrations below the MWQSOGs for PAL in Gauer Lake, but aluminum and selenium exceeded PAL guidelines in Granville (Table 5.3.4-7). Like Southern Indian Lake, the majority (83%) of samples collected from Granville Lake exceeded the PAL guideline of 0.1 mg/L for aluminum (Figure 5.3.4-79) and three samples collected in Granville Lake were also at or slightly above the PAL for selenium (0.001 mg/L; Table 5.3.4-7). As previously noted, measurements that are at or near analytical DLs are associated with relatively high uncertainty and there is low confidence that an actual exceedance of a PAL guideline has occurred when the measurement is at or near the DL. Mercury was not detected in any of the samples where mercury was analysed using a DL lower than the current PAL guideline. Unlike Southern Indian Lake, iron was consistently below the PAL guideline in Gauer and Granville lakes (Figure 5.3.4-80).

Seasonal Variability

As noted for the routine parameters, metals and major ions measured in SIL-Area 4 were statistically similar between seasons while a number of parameters varied seasonally in Granville and Gauer lakes. Granville Lake tended to have significantly lower metal concentrations in spring but Gauer Lake had significantly higher concentrations of some metals in winter compared to the other seasons. Metals that exhibited these statistically significant seasonal differences included: hardness (Figure 5.3.4-82) and strontium (Figure 5.3.4-83) in both Granville and Gauer lakes; rubidium (Figure 5.3.4-84), magnesium (Figure 5.3.4-85), and potassium (Figure 5.3.4-86) in Granville Lake; and barium (Figure 5.3.4-87) sodium (Figure 5.3.4-88) in Gauer Lake. Manganese in Gauer Lake was also lower in winter compared to the other seasons (Figure 5.3.4-89).

Spatial Comparisons

Like the routine water quality parameters, a number of statistically significant differences were observed for metal concentrations measured in the two annual waterbodies located on the upper Churchill River (i.e., SIL-Area 4 and Granville Lake). SIL-Area 4 had significantly higher hardness (Figure 5.3.4-77) and concentrations of calcium (Figure 5.3.4-90), copper (Figure 5.3.4-91), magnesium (Figure 5.3.4-92), and thorium (Figure 5.3.4-93) than Granville Lake. In contrast, barium (Figure 5.3.4-94) and manganese (Figure 5.3.4-95) were lower in SIL-Area 4 than at Granville Lake.

Similar to the routine water quality variables discussed above, a number of metals were significantly higher in Gauer Lake than at SIL-Area 4 or Granville Lake, including: calcium (Figure 5.3.4-90); magnesium (Figure 5.3.4-92); manganese (Figure 5.3.4-95); and uranium (Figure 5.3.4-96). Gauer Lake was also harder (i.e., higher hardness) than either SIL-Area 4 or Granville Lake (Figure 5.3.4-77). In contrast, aluminum (Figure 5.3.4-79), barium (Figure 5.3.4-94), copper (Figure 5.3.4-91), iron (Figure 5.3.4-80), potassium (Figure 5.3.4-97), rubidium (Figure 5.3.4-98), sodium (Figure 5.3.4-99), thorium (Figure 5.3.4-93), and titanium (Figure 5.3.4-100) concentrations were lower in Gauer Lake than the other annual waterbodies.

While statistical analyses did not incorporate SIL-Area 1 or SIL-Area 6 into the spatial comparisons due to limited data, few qualitative differences between the areas were noted. Sulphate was lower at SIL-Area 6 than at SIL-Area 1 (Figure 5.3.4-78), and like some of the routine water quality parameters, water hardness (Figure 5.3.4-77) and concentrations of calcium (Figure 5.3.4-90) and magnesium (Figure 5.3.4-92) were slightly higher in SIL-Area 4 compared to Areas 1 and 6. Statistical differences will be re-assessed in the future when additional data are acquired for these areas.

Temporal Comparisons

Statistical comparisons between sampling years for annual waterbodies revealed few significant differences. At SIL-Area 4, iron (Figure 5.3.4-101), rubidium (Figure 5.3.4-102), and titanium (Figure 5.3.4-103) significantly increased between 2008 and 2010. In contrast, sulphate concentrations in Granville and Gauer lakes were significantly higher in 2009 than other years (Figure 5.3.4-104), and chloride (Figure 5.3.4-105) in Gauer Lake was lowest in 2010.

The lack of consistent year-to-year differences indicates that water quality conditions in the Upper Churchill River Region remained generally stable during the monitoring program and/or temporal differences were not large enough to be detected statistically. This lack of interannual differences is notable in light of the relatively large range of water levels and flows observed in the Upper Churchill River Region over the period of 2008-2010 (see Section 5.3.2 for a discussion of hydrological conditions). Future evaluations of temporal variability or trends will be undertaken when additional data are acquired for the region.

Table 5.3.4-1. Saffran and Trew (1996) categorization of acid sensitivity of aquatic ecosystems and sensitivity ranking for the Upper Churchill River Region.

Parameter	Units	Acid Sensitivity								
		High	Moderate	Low	Least	Granville Lake	SIL-Area 1	SIL-Area 6	SIL-Area 4	Gauer Lake
pH	-	<6.5	6.6-7.0	7.1-7.5	>7.5	Least	Least	Least	Least	Least
Total Alkalinity	mg/L (as $CaCO_3$)	0-10	11-20	21-40	>40	Low	Low	Least	Least	Least
Calcium	mg/L	0-4	5-8	9-25	>25	Moderate	Moderate	Low	Low	Low
Total Dissolved Solids	mg/L	0-50	51-200	201-500	>500	Moderate	Moderate	Moderate	Moderate	Moderate

Table 5.3.4-2. Total phosphorus concentrations (open-water season and annual means) measured in the Upper Churchill River Region and CCME (1999; updated to 2013) trophic categorization: 2008-2010.

Waterbody	Period	Lake Trophic Status Based on TP (mg/L)						Years Sampled
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic	
		<0.004	0.004 - 0.010	0.010 - 0.020	0.020 - 0.035	0.035 - 0.100	> 0.100	
Granville Lake	Open-water season			0.017				2008
	Annual			0.016				2008/2009
	Open-water season			0.017				2009
	Annual			0.017				2009/2010
	Open-water season				0.022			2010
	Annual				0.020			2010/2011
	Open-water season			0.019				2008/2009-2010/2011
	Annual			0.018				2008/2009-2010/2011
Southern Indian Lake-Area 1	Open-water season				0.023			2009
	Annual				0.021			2009/2010
Southern Indian Lake-Area 6	Open-water season				0.026			2010
	Annual				0.024			2010/2011
Southern Indian Lake-Area 4	Open-water season			0.010				2008
	Annual			0.016				2008/2009
	Open-water season			0.012				2009
	Annual			0.016				2009/2010
	Open-water season				0.024			2010
	Annual				0.022			2010/2011
	Open-water season			0.015				2008/2009-2010/2011
	Annual			0.016				2008/2009-2010/2011
Gauer Lake	Open-water season				0.020			2008
	Annual			0.019				2008/2009
	Open-water season			0.016				2009
	Annual			0.016				2009/2010
	Open-water season				0.024			2010
	Annual				0.021			2010/2011
	Open-water season				0.020			2008/2009-2010/2011
	Annual			0.019				2008/2009-2010/2011

Table 5.3.4-3. Chlorophyll *a* concentrations (open-water season and annual means) measured in lakes of the Upper Churchill River Region and the OECD (1982) trophic categorization scheme for lakes: 2008/2009-2010/2011.

Waterbody	Period	Lake Trophic Status Based on Chlorophyll *a* (µg/L)						Years Sampled
		Ultra-oligotrophic -	Oligotrophic < 2.5	Mesotrophic 2.5 - 8	Meso-eutrophic -	Eutrophic 8 - 25	Hyper-eutrophic > 25	
Granville Lake	Open-water season			4.3				2008
	Annual			4.3				2008/2009
	Open-water season			3.4				2009
	Annual			2.8				2009/2010
	Open-water season			4.2				2010
	Annual			3.4				2010/2011
	Open-water season			4.0				2008/2009-2010/2011
	Annual			3.5				2008/2009-2010/2011
Southern Indian Lake-Area 1	Open-water season			3.4				2009
	Annual			2.7				2009/2010
Southern Indian Lake-Area 6	Open-water season		1.7					2010
	Annual		1.3					2010/2011
Southern Indian Lake-Area 4	Open-water season		2.3					2008
	Annual		1.9					2008/2009
	Open-water season		1.8					2009
	Annual		1.8					2009/2010
	Open-water season			3.2				2010
	Annual			2.7				2010/2011
	Open-water season		2.4					2008/2009-2010/2011
	Annual		2.0					2008/2009-2010/2011
Gauer Lake	Open-water season					9.3		2008
	Annual			7.1				2008/2009
	Open-water season			5.6				2009
	Annual			4.5				2009/2010
	Open-water season		1.7					2010
	Annual		1.6					2010/2011
	Open-water season			5.5				2008/2009-2010/2011
	Annual			4.4				2008/2009-2010/2011

Table 5.3.4-4. Total nitrogen concentrations (open-water season and annual means) measured in the Upper Churchill River Region and comparison to a trophic categorization scheme for lakes (Nürnberg 1996): 2008/2009-2010/2011.

Waterbody	Period	Lake Trophic Status Based on Total Nitrogen (mg/L)						Years Sampled
		Ultra-oligotrophic	Oligotrophic	Mesotrophic	Meso-eutrophic	Eutrophic	Hyper-eutrophic	
		-	<0.350	0.350-0.650	-	0.651-1.2	>1.2	
Granville Lake	Open-water season			0.38				2008
	Annual			0.38				2008/2009
	Open-water season		0.21					2009
	Annual		0.27					2009/2010
	Open-water season			0.39				2010
	Annual			0.40				2010/2011
	Open-water season		0.33					2008/2009-2010/2011
	Annual			0.35				2008/2009-2010/2011
Southern Indian Lake-Area 1	Open-water season		0.21					2009
	Annual		0.28					2009/2010
Southern Indian Lake-Area 6	Open-water season		0.33					2010
	Annual		0.34					2010/2011
Southern Indian Lake-Area 4	Open-water season		0.28					2008
	Annual		0.30					2008/2009
	Open-water season		0.18					2009
	Annual		0.26					2009/2010
	Open-water season		0.30					2010
	Annual		0.33					2010/2011
	Open-water season		0.25					2008/2009-2010/2011
	Annual		0.30					2008/2009-2010/2011
Gauer Lake	Open-water season			0.46				2008
	Annual			0.44				2008/2009
	Open-water season		0.23					2009
	Annual		0.32					2009/2010
	Open-water season			0.49				2010
	Annual			0.49				2010/2011
	Open-water season			0.39				2008/2009-2010/2011
	Annual			0.41				2008/2009-2010/2011

Table 5.3.4-5. Detection frequency and summary statistics for *E. coli* (CFU/100 mL) measured in the Upper Churchill River Region.

Waterbody	Sample Years	# Detected	n	% Detected	Mean	Median	Max
Granville Lake	2008-2010	2	12	17	<10	<1	<10
Southern Indian Lake-Area 1	2009	0	4	0	<10	<1	<10
Southern Indian Lake-Area 6	2010	1	4	25	<1	<1	1
Southern Indian Lake-Area 4	2008-2010	0	12	0	<10	<1	<10
Gauer Lake	2008-2010	2	12	17	<10	<1	<10

Table 5.3.4-6. Frequency of detection of metals and major ions measured in the Upper Churchill River Region: 2008-2010. Values in bold indicate annual sites where detection frequencies ≥30%.

Waterbody	Sample Years		Aluminum	Antimony	Arsenic	Barium	Beryllium	Bismuth	Boron	Cadmium	Calcium	Cesium	Chloride-Dissolved	Chromium	Cobalt	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum
Granville Lake	2008-2010	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	12	12	12	12
		# Detected	12	1	3	12	0	0	3	3	12	0	12	2	2	7	12	2	3	12	12	0	2
		% Detected	**100**	8	25	**100**	0	0	25	25	**100**	0	**100**	17	17	**58**	**100**	17	**75**	**100**	**100**	0	17
Southern Indian Lake-Area 1	2009	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	4	4	4	4
		# Detected	4	0	0	4	0	0	0	1	4	1	4	2	2	3	4	2	-	4	4	0	1
		% Detected	**100**	0	0	**100**	0	0	0	25	**100**	25	**100**	**50**	**50**	**75**	**100**	**50**	-	**100**	**100**	0	25
Southern Indian Lake-Area 6	2010	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	4	0	3	4	0	0	1	0	4	1	4	2	2	4	4	4	3	4	4	0	0
		% Detected	**100**	0	**75**	**100**	0	0	25	0	**100**	25	**100**	**50**	**50**	**100**	**100**	**100**	**75**	**100**	**100**	0	0
Southern Indian Lake-Area 4 -Surface	2008-2010	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	12	12	12	12
		# Detected	12	0	4	12	0	0	0	3	12	0	12	3	1	12	12	4	3	12	12	0	3
		% Detected	**100**	0	**33**	**100**	0	0	0	25	**100**	0	**100**	25	8	**100**	**100**	**33**	**75**	**100**	**100**	0	25
Southern Indian Lake-Area 4 -Bottom	2008	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
		# Detected	1	0	0	1	0	0	0	0	1	0	1	1	1	1	1	0	-	1	1	0	1
		% Detected	**100**	0	0	**100**	0	0	0	0	**100**	0	**100**	**100**	**100**	**100**	**100**	0	-	**100**	**100**	0	**100**
Gauer Lake	2008-2010	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	12	12	12	12
		# Detected	12	0	3	12	0	0	0	6	12	0	11	1	1	6	10	1	0	12	12	0	3
		% Detected	**100**	0	25	**100**	0	0	0	**50**	**100**	0	**92**	8	8	**50**	**83**	8	0	**100**	**100**	0	25

Table 5.3.4-6. continued.

Waterbody	Sample Years		Nickel	Potassium	Rubidium	Selenium	Silicon	Silver	Sodium	Strontium	Sulphate-Dissolved	Tellurium	Thallium	Thorium	Tin	Titanium	Tungsten	Uranium	Vanadium	Zinc	Zirconium
Granville Lake	2008-2010	n	12	12	12	12	4	12	12	12	12	12	12	4	12	12	12	12	12	12	12
		# Detected	0	12	12	3	4	0	12	12	12	0	0	0	3	12	1	6	4	1	1
		% Detected	0	**100**	**100**	25	**100**	0	**100**	**100**	**100**	0	0	0	25	**100**	8	**50**	**33**	8	8
Southern Indian Lake-Area 1	2009	n	4	4	4	4	0	4	4	4	4	4	4	0	4	4	4	4	4	4	4
		# Detected	1	4	4	0	-	0	4	4	4	0	0	-	1	4	0	2	2	0	2
		% Detected	25	**100**	**100**	0	-	0	**100**	**100**	**100**	0	0	-	25	**100**	0	**50**	**50**	0	**50**
Southern Indian Lake-Area 6	2010	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
		# Detected	0	4	4	0	4	0	4	4	4	0	0	4	1	4	0	3	4	0	4
		% Detected	0	**100**	**100**	0	**100**	0	**100**	**100**	**100**	0	0	**100**	25	**100**	0	**75**	**100**	0	**100**
Southern Indian Lake-Area 4 -Surface	2008-2010	n	12	12	12	12	4	12	12	12	12	12	12	4	12	12	12	12	12	12	12
		# Detected	2	12	12	2	4	0	12	12	12	0	0	4	4	12	0	11	6	0	5
		% Detected	17	**100**	**100**	17	**100**	0	**100**	**100**	**100**	0	0	**100**	**33**	**100**	0	**92**	**50**	0	**42**
Southern Indian Lake-Area 4 -Bottom	2008	n	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1
		# Detected	1	1	1	0	-	0	1	1	1	0	0	-	1	1	0	1	0	0	0
		% Detected	**100**	**100**	**100**	0	-	0	**100**	**100**	**100**	0	0	-	**100**	**100**	0	**100**	0	0	0
Gauer Lake	2008-2010	n	12	12	12	12	4	12	12	12	12	12	12	4	12	12	12	12	12	12	12
		# Detected	2	12	12	0	4	0	12	12	7	0	0	0	5	7	1	12	4	0	0
		% Detected	**17**	**100**	**100**	0	**100**	0	**100**	**100**	**58**	0	0	0	**42**	**58**	8	**100**	**33**	0	0

Table 5.3.4-7. Frequency of exceedances of MWQSOGs for PAL for total metals measured in the Upper Churchill River Region: 2008-2010. Values in bold indicate exceedances occurred at a given site.

Waterbody	Years		Aluminum	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Mercury[1]	Molybdenum	Nickel	Selenium	Silver	Thallium	Uranium	Zinc
		MWQSOGs PAL	0.1	0.15	1.5	0.00010-0.00022	0.0294-0.0680	0.0031-0.0073	0.3	0.00061-0.00220	0.000026	0.073	0.0713-0.0408	0.001	0.0001	0.0008	0.015	0.0398-0.0938
Granville Lake	2008-2010	n	**12**	12	12	12	12	12	12	12	3	12	12	**12**	12	12	12	12
		# Exceedances	**10**	0	0	0	0	0	0	0	0	0	0	**3**	0	0	0	0
		% Exceedances	**83**	0	0	0	0	0	0	0	0	0	0	**25**	0	0	0	0
Southern Indian Lake-Area 1	2009	n	**4**	4	4	4	4	4	**4**	**4**	3	4	4	4	4	4	4	4
		# Exceedances	**4**	0	0	0	0	0	**2**	**2**	0	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	**50**	**50**	0	0	0	0	0	0	0	0
Southern Indian Lake-Area 6	2010	n	**4**	4	4	4	4	4	**4**	4	0	4	4	4	4	4	4	4
		# Exceedances	**4**	0	0	0	0	0	**3**	0	-	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	**75**	0	-	0	0	0	0	0	0	0
Southern Indian Lake-Area 4 -Surface	2008-2010	n	**12**	12	12	12	12	12	**12**	12	3	12	12	**12**	12	12	12	12
		# Exceedances	**10**	0	0	0	0	0	**1**	0	0	0	0	**2**	0	0	0	0
		% Exceedances	**83**	0	0	0	0	0	**8**	0	0	0	0	**17**	0	0	0	0
Southern Indian Lake-Area 4 -Bottom	2008	n	**1**	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
		# Exceedances	**1**	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0
		% Exceedances	**100**	0	0	0	0	0	0	0	-	0	0	0	0	0	0	0
Gauer Lake	2008-2010	n	12	12	12	12	12	12	12	12	3	12	12	12	12	12	12	12
		# Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		% Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

[1] Includes samples analysed at an analytical detection limit lower than the PAL guideline (i.e., <0.000026 mg/L).

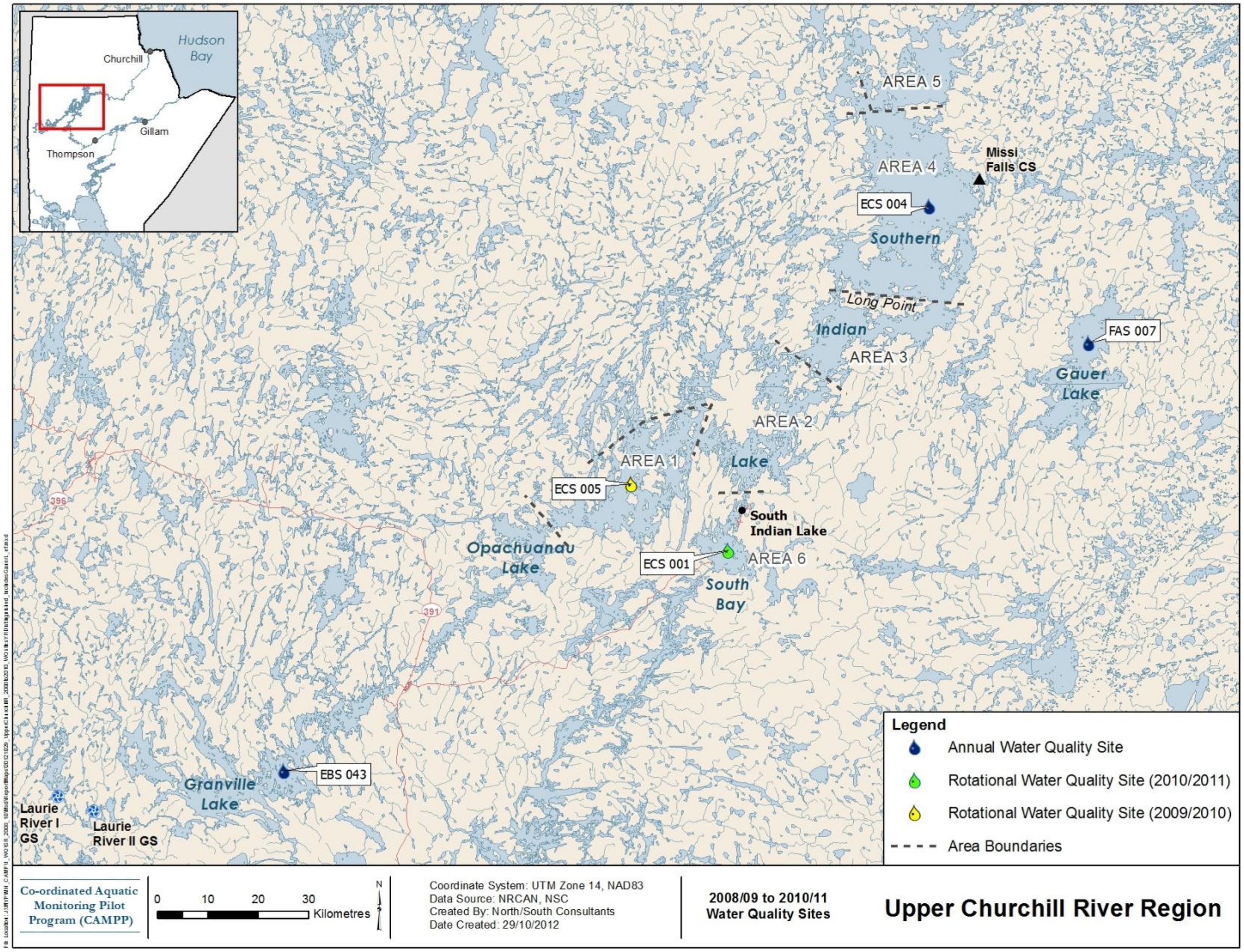


Figure 5.3.4-1. Water quality and phytoplankton monitoring sites in the Upper Churchill River Region.

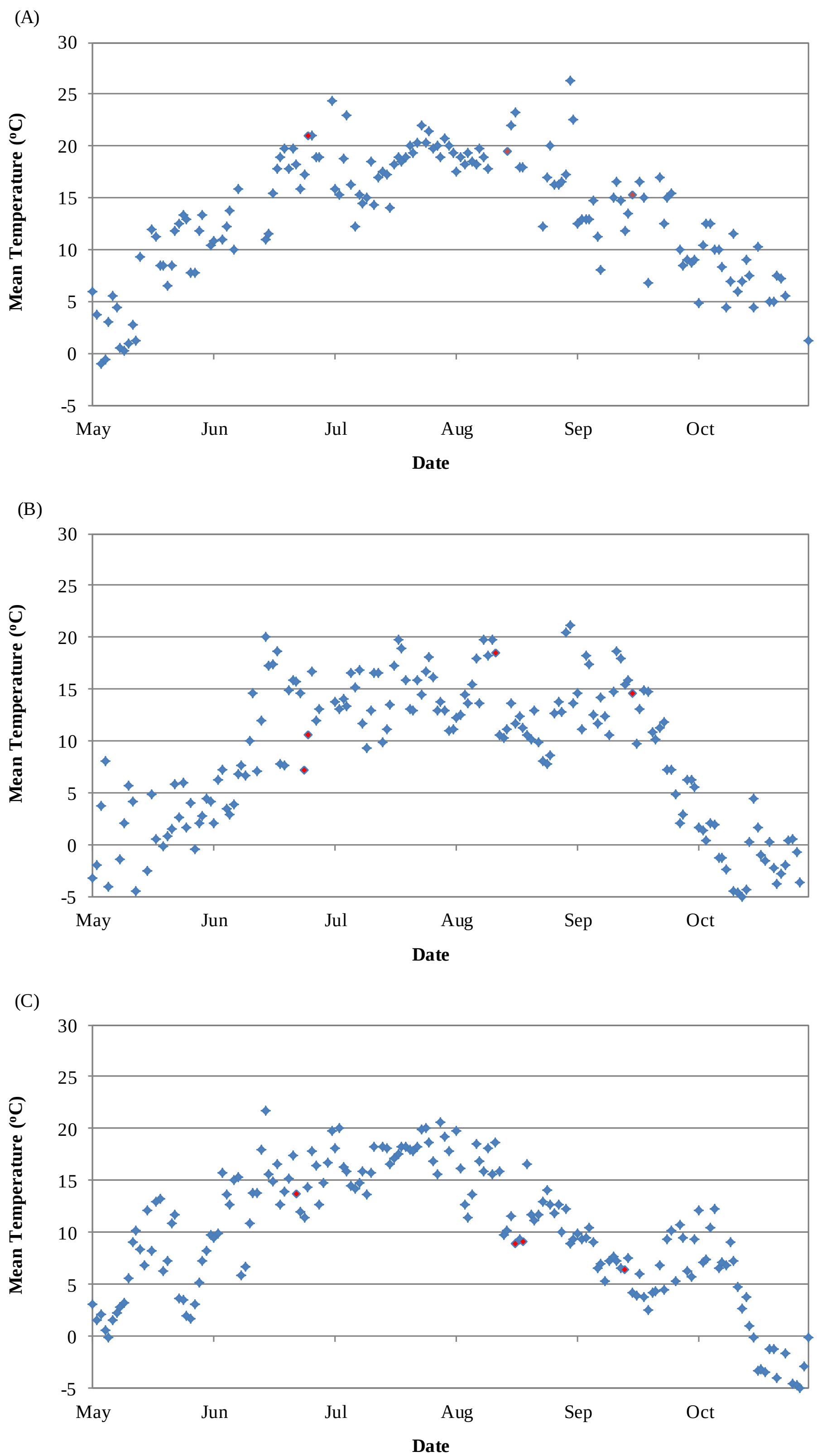


Figure 5.3.4-2. Mean daily air temperature and water quality sampling dates (indicated in red) for the Upper Churchill River Region: (A) 2008; (B) 2009; and (C) 2010.

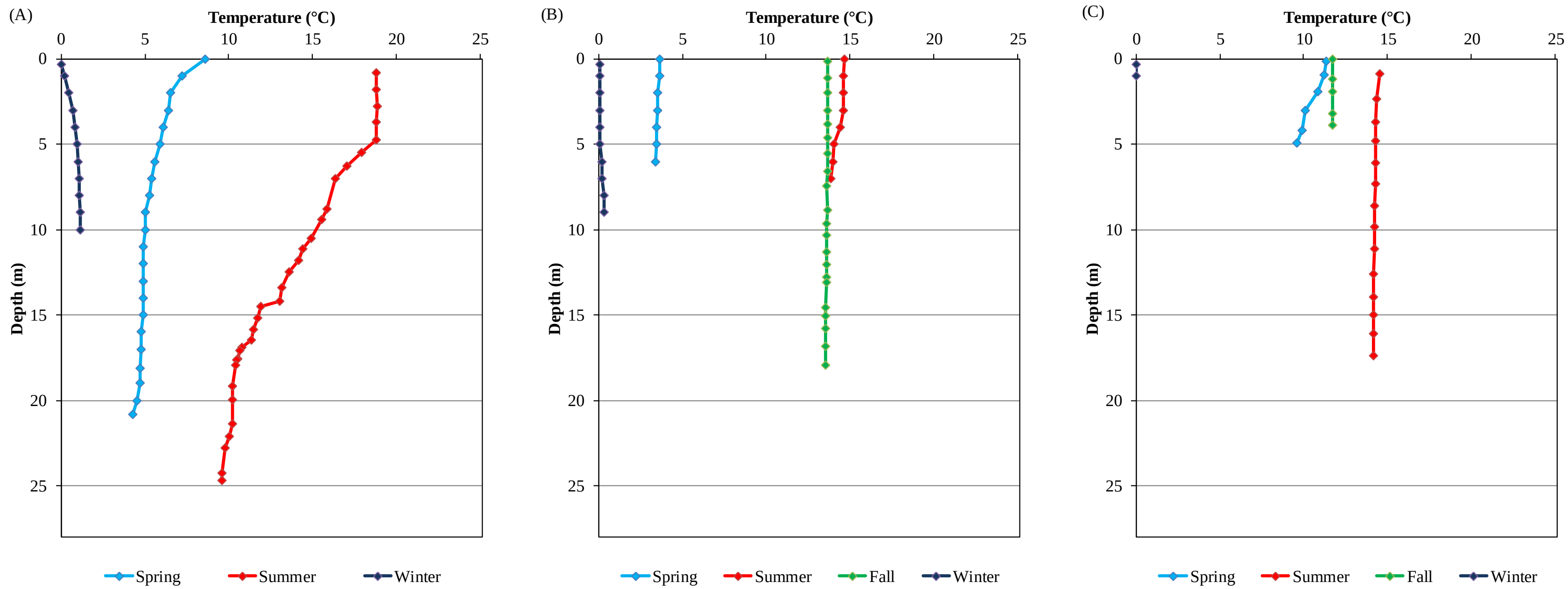


Figure 5.3.4-3. Water temperature profiles measured in Southern Indian Lake-Area 4: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

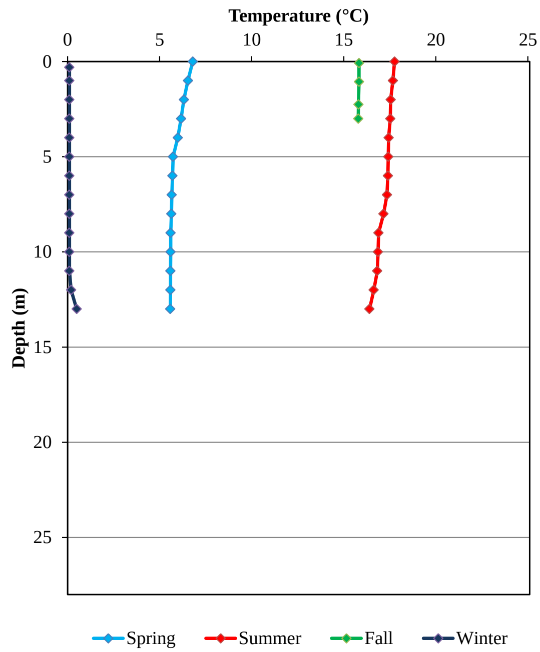


Figure 5.3.4-4. Water temperature profiles measured in Southern Indian Lake-Area 1, 2009/2010.

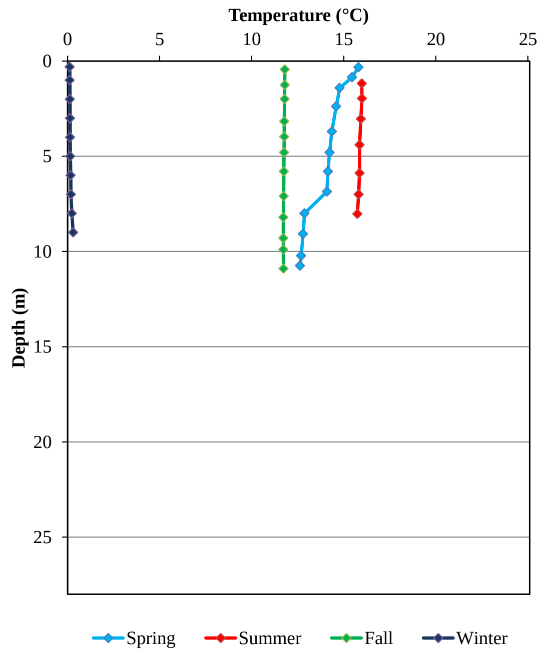


Figure 5.3.4-5. Water temperature profiles measured in Southern Indian Lake-Area 6, 2010/2011.

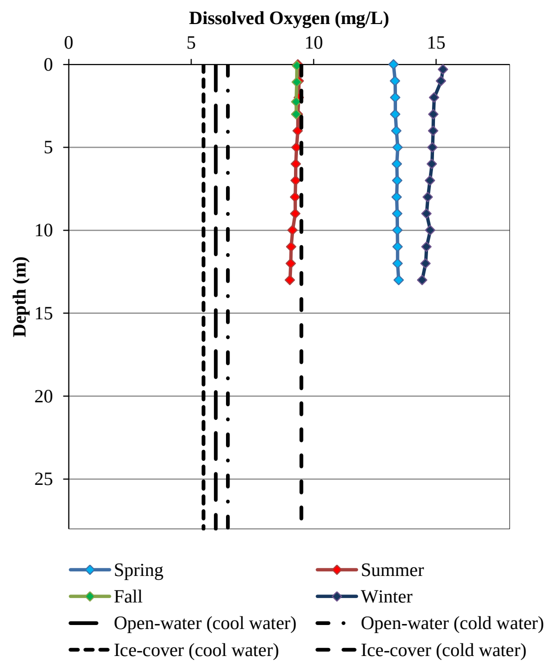


Figure 5.3.4-6. Dissolved oxygen depth profiles measured in Southern Indian Lake-Area 1, 2009/2010.

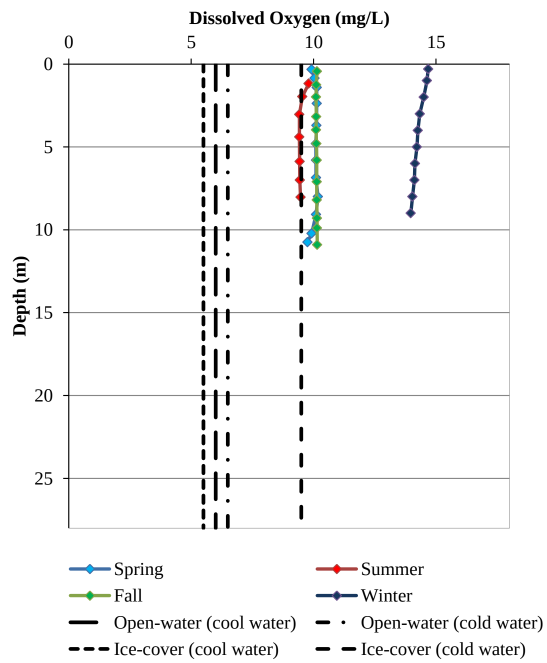


Figure 5.3.4-7. Dissolved oxygen depth profiles measured in Southern Indian Lake-Area 6, 2010/2011.

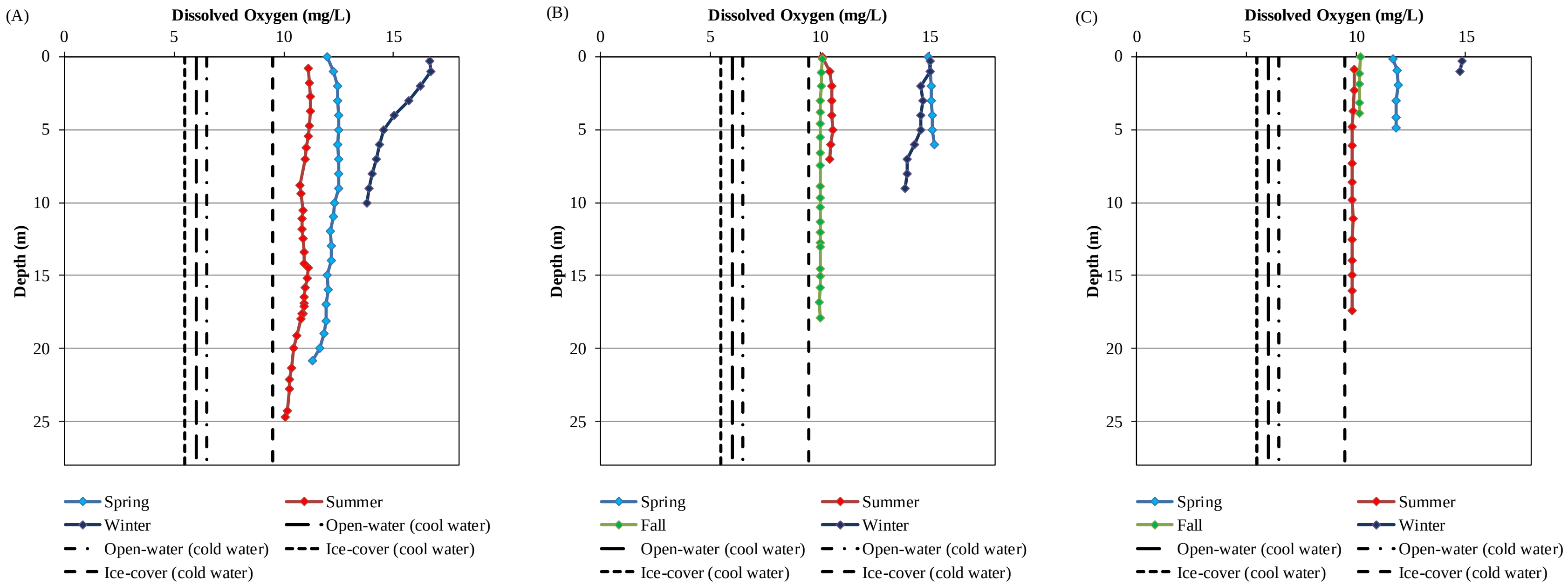


Figure 5.3.4-8. Dissolved oxygen depth profiles measured in Southern Indian Lake-Area 4: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

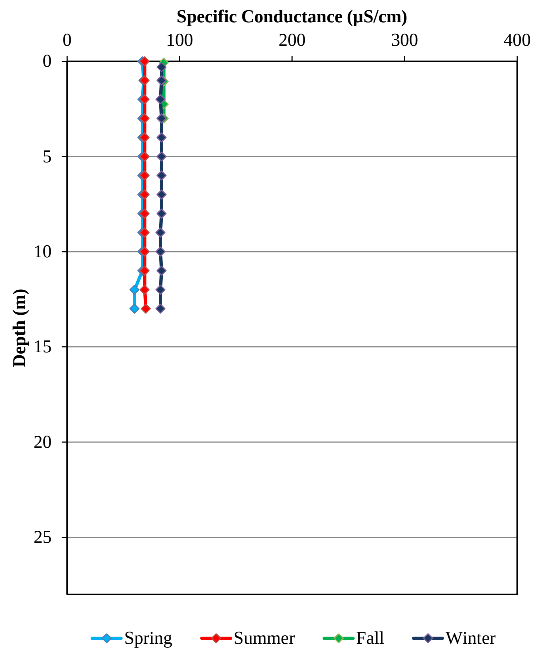


Figure 5.3.4-9. Specific conductance depth profiles measured in Southern Indian Lake-Area 1: 2009/2010.

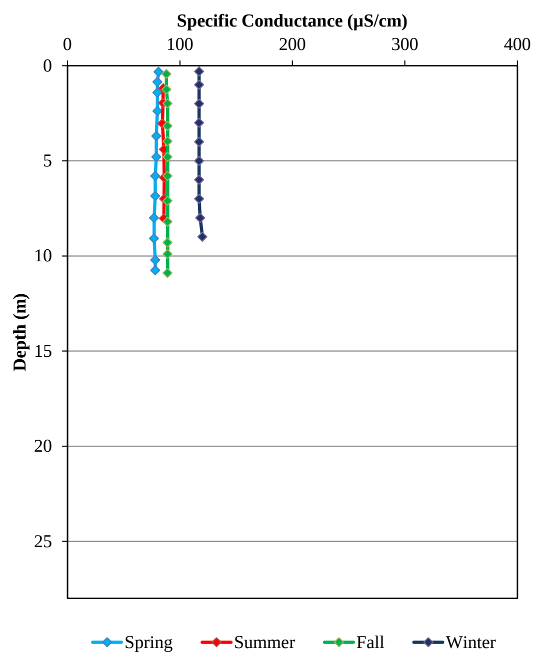


Figure 5.3.4-10. Specific conductance depth profiles measured in Southern Indian Lake-Area 6: 2010/2011.

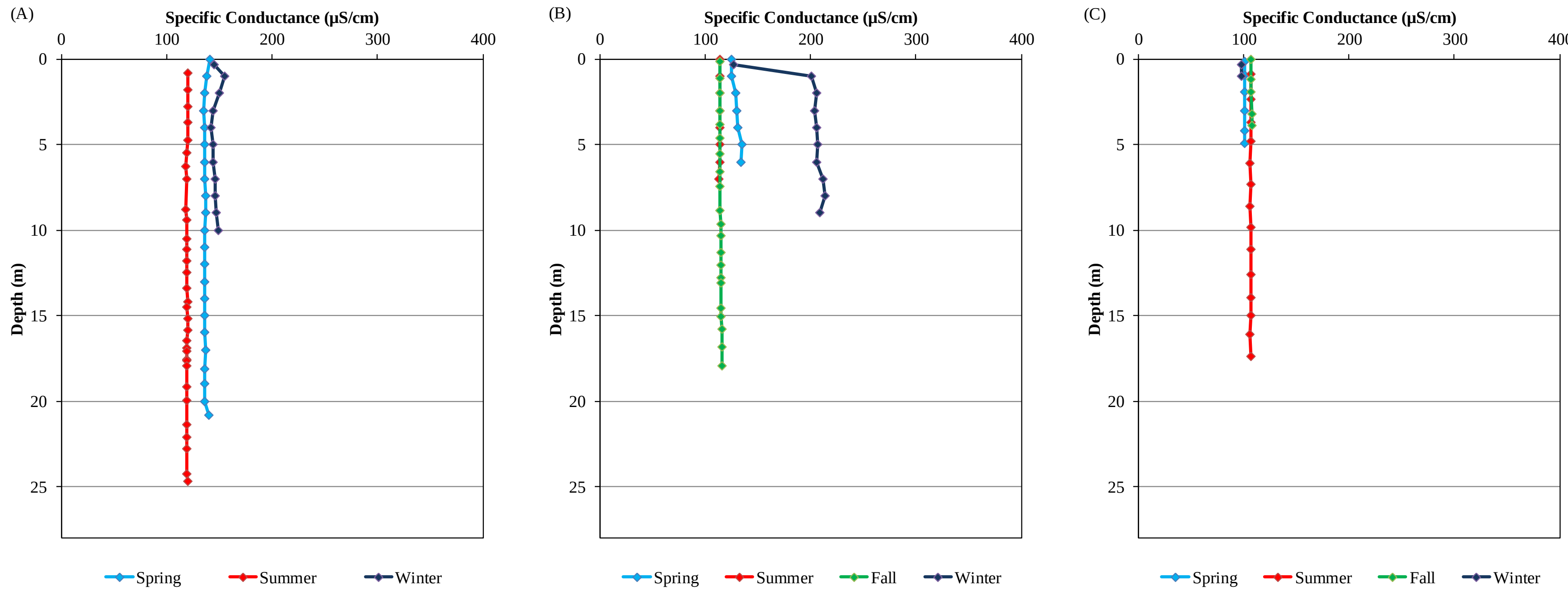


Figure 5.3.4-11. Specific conductance depth profiles measured in Southern Indian Lake-Area 4: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

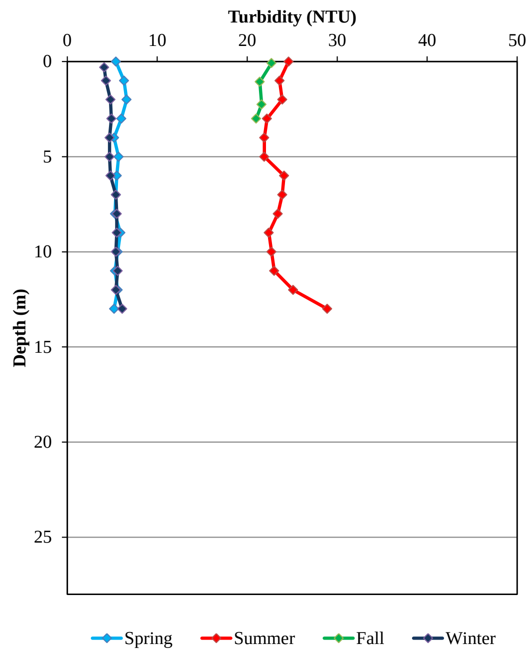


Figure 5.3.4-12. Turbidity depth profiles measured in Southern Indian Lake-Area 1: 2009/2010.

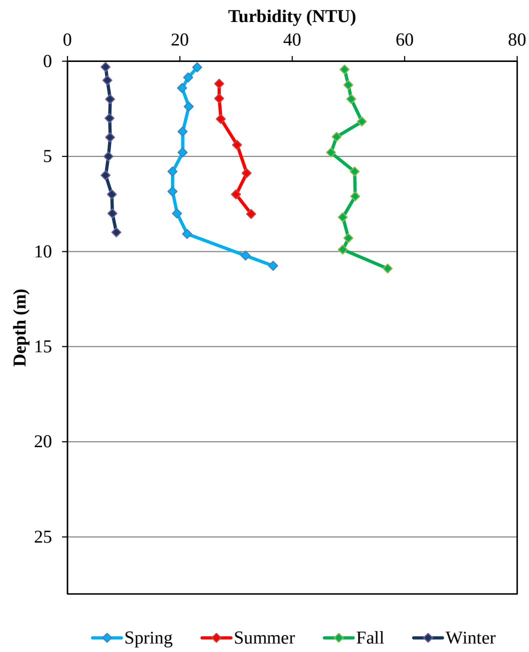


Figure 5.3.4-13. Turbidity depth profiles measured in Southern Indian Lake-Area 6: 2010/2011.

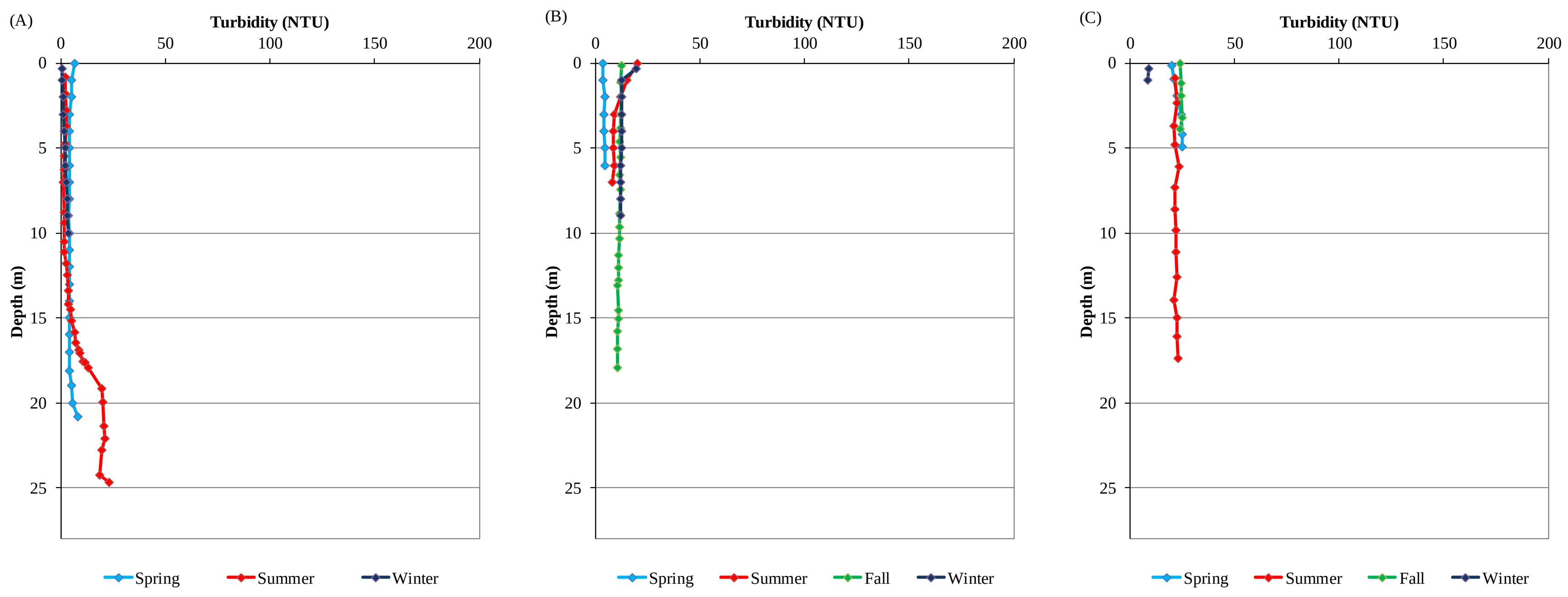


Figure 5.3.4-14. Turbidity depth profiles measured in Southern Indian Lake-Area 4: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

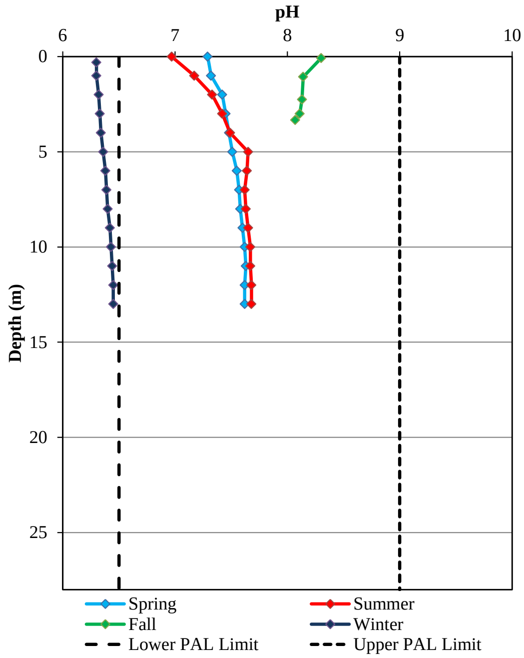


Figure 5.3.4-15. pH depth profiles measured in Southern Indian Lake-Area 1: 2009/2010.

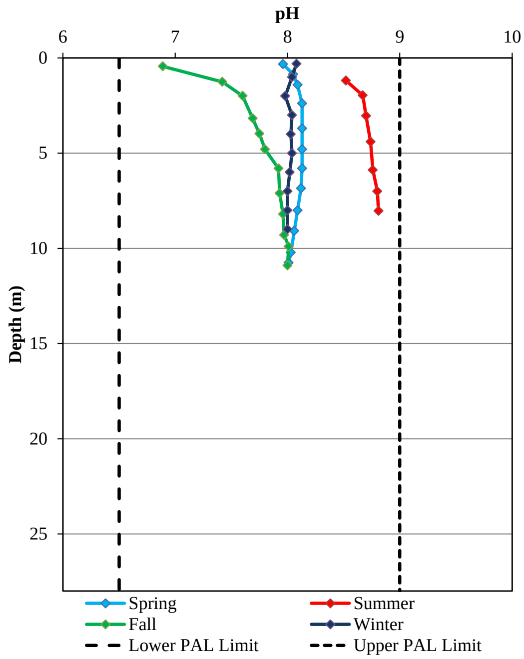


Figure 5.3.4-16. pH depth profiles measured in Southern Indian Lake-Area 6: 2010/2011.

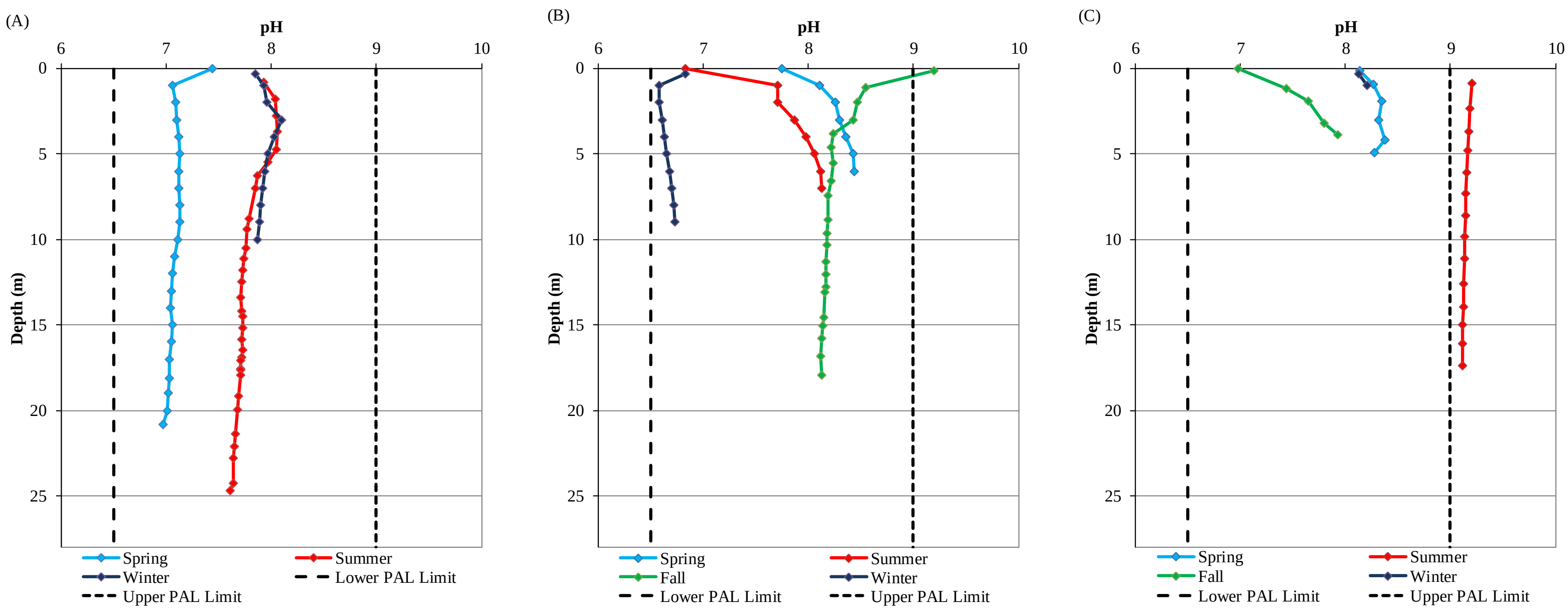


Figure 5.3.4-17. pH depth profiles measured in Southern Indian Lake-Area 4: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

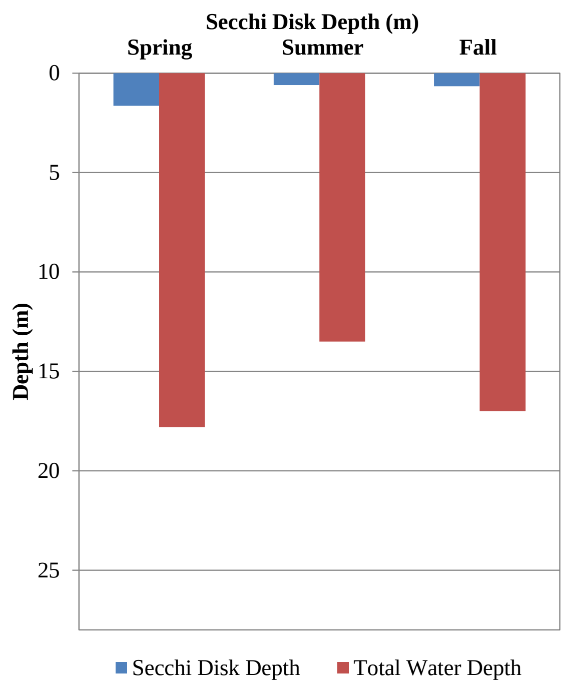


Figure 5.3.4-18. Secchi disk depths measured in Southern Indian Lake-Area 1: 2009/2010.

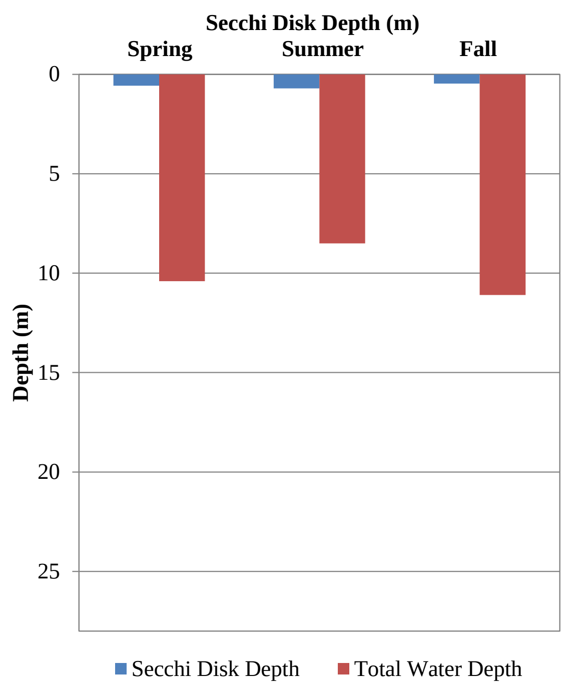


Figure 5.3.4-19. Secchi disk depths measured in Southern Indian Lake-Area 6: 2010/2011.

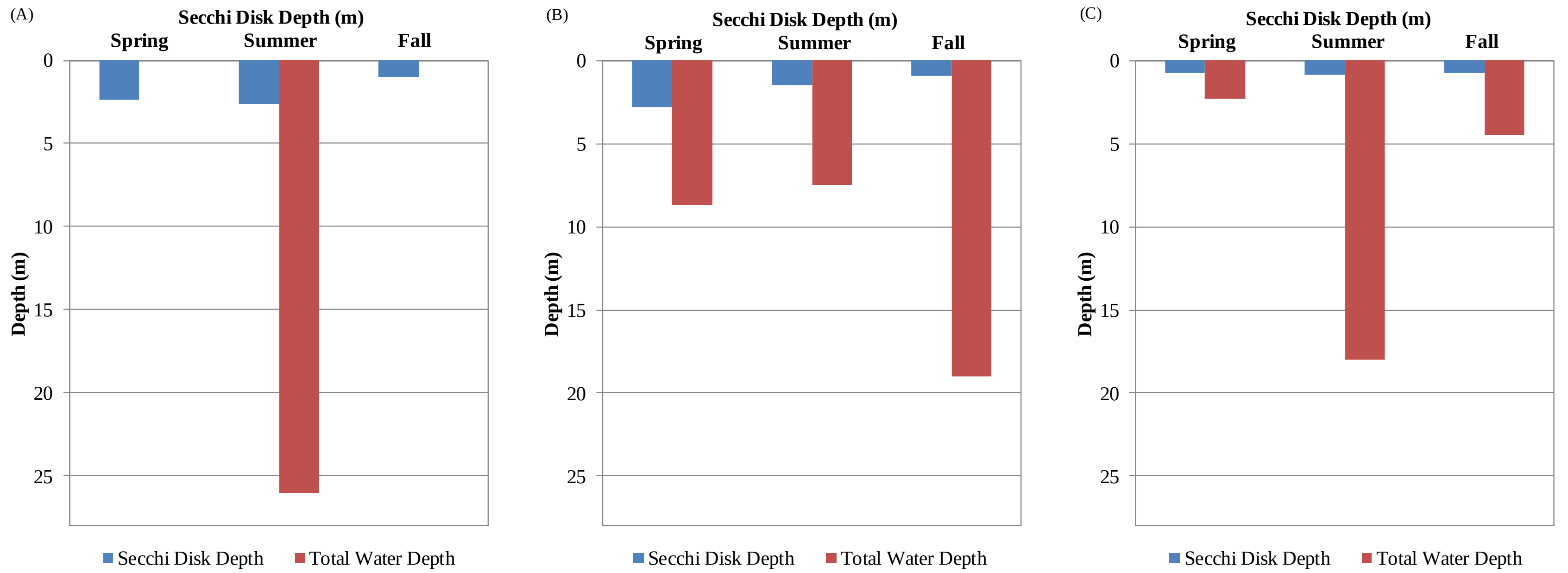


Figure 5.3.4-20. Secchi disk depths measured in Southern Indian Lake-Area 4: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

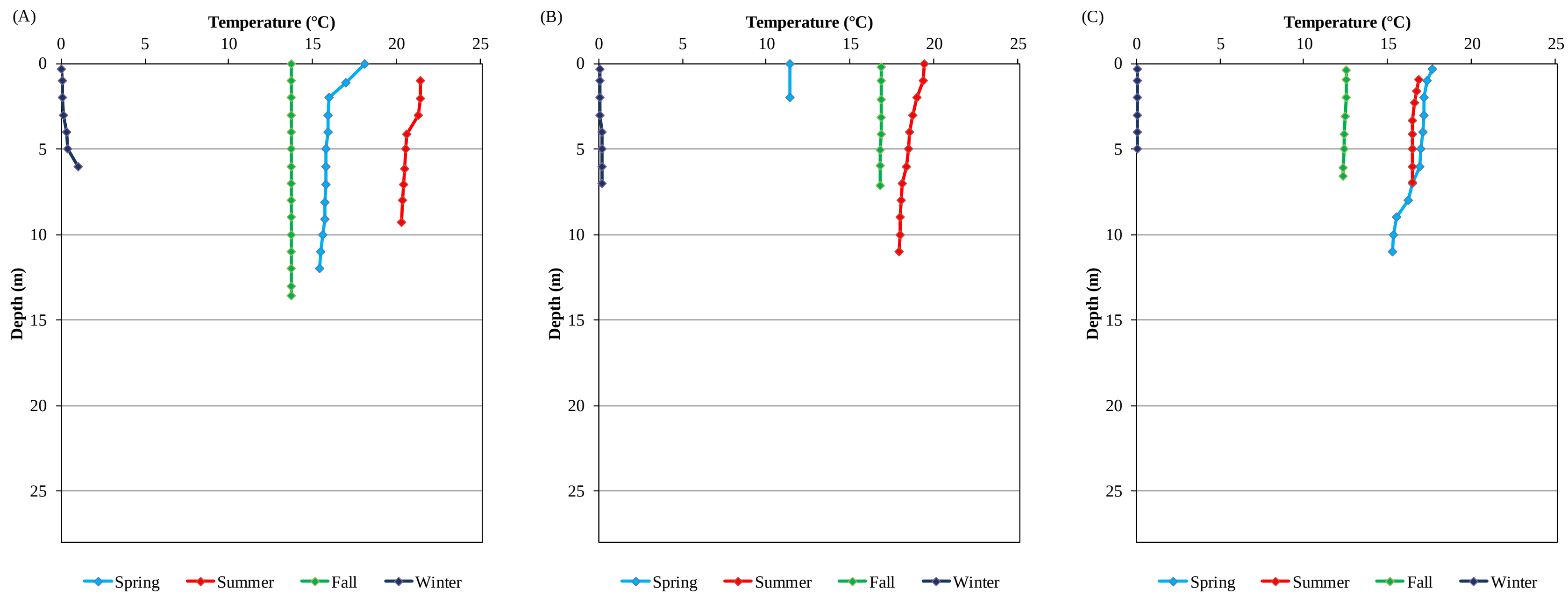


Figure 5.3.4-21. Water temperature profiles measured in Granville Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

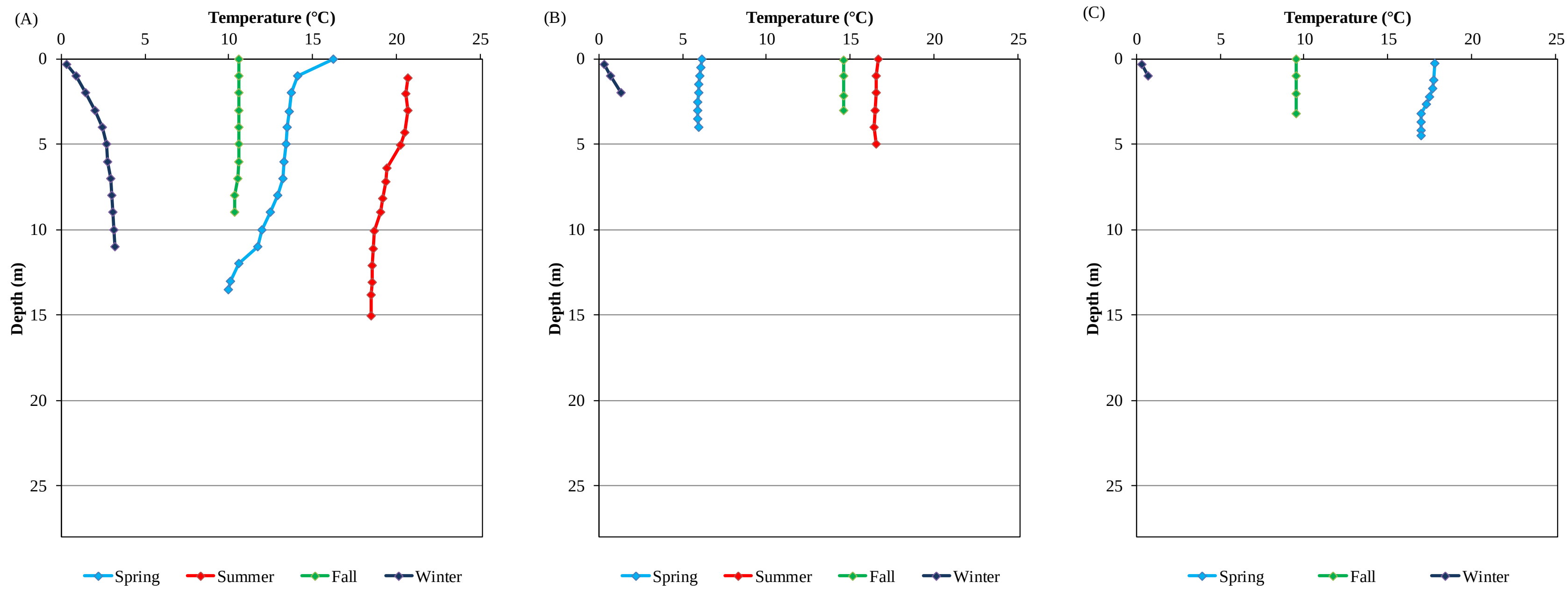


Figure 5.3.4-22. Water temperature profiles measured in Gauer Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

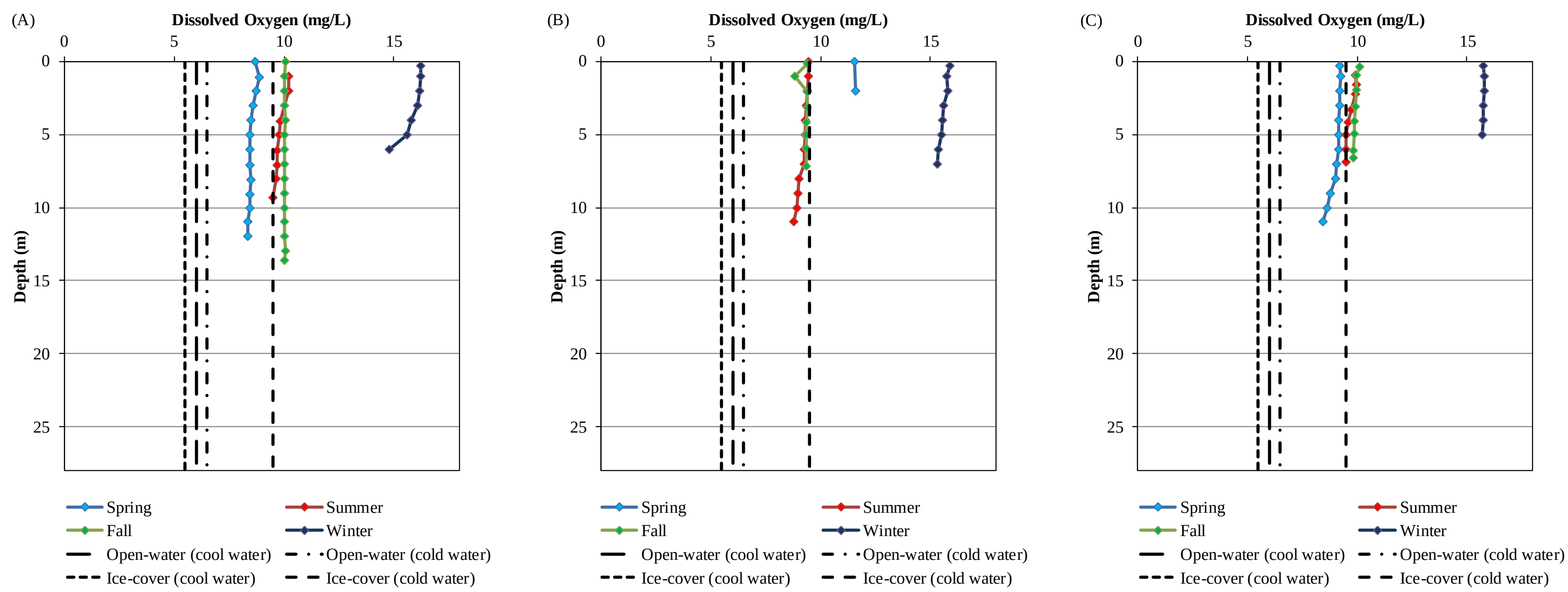


Figure 5.3.4-23. Dissolved oxygen depth profiles measured in Granville Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

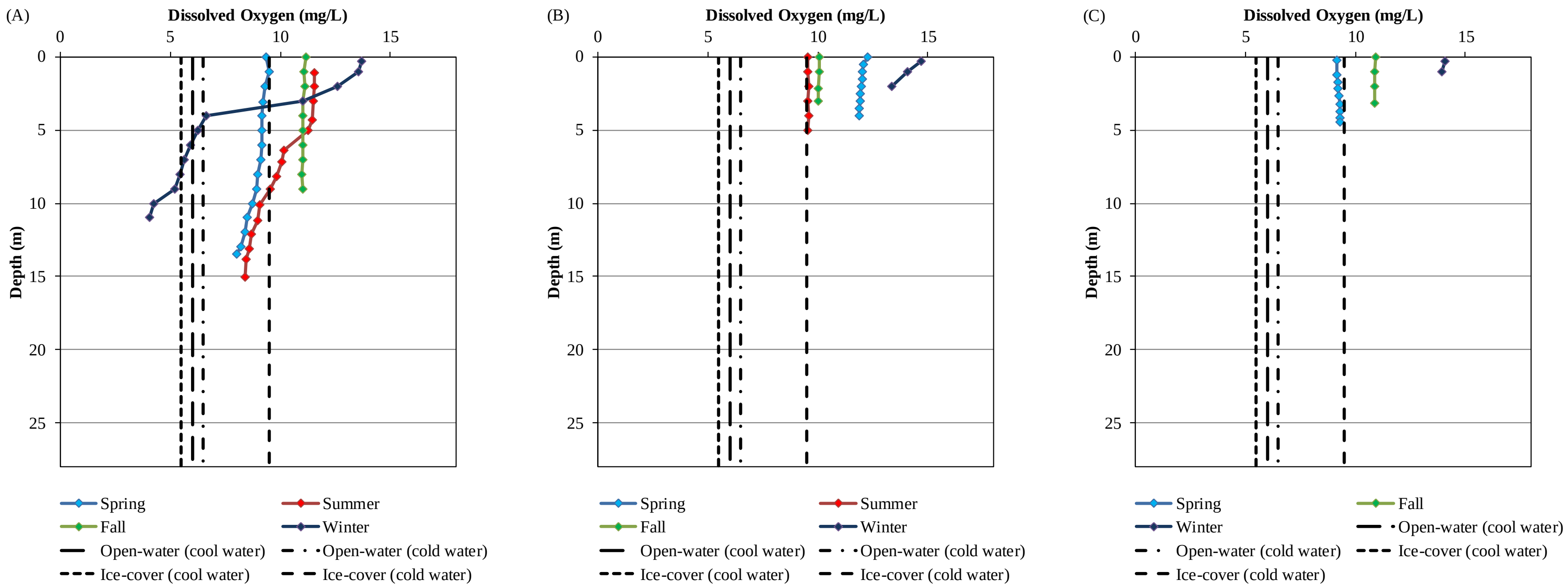


Figure 5.3.4-24. Dissolved oxygen depth profiles measured in Gauer Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

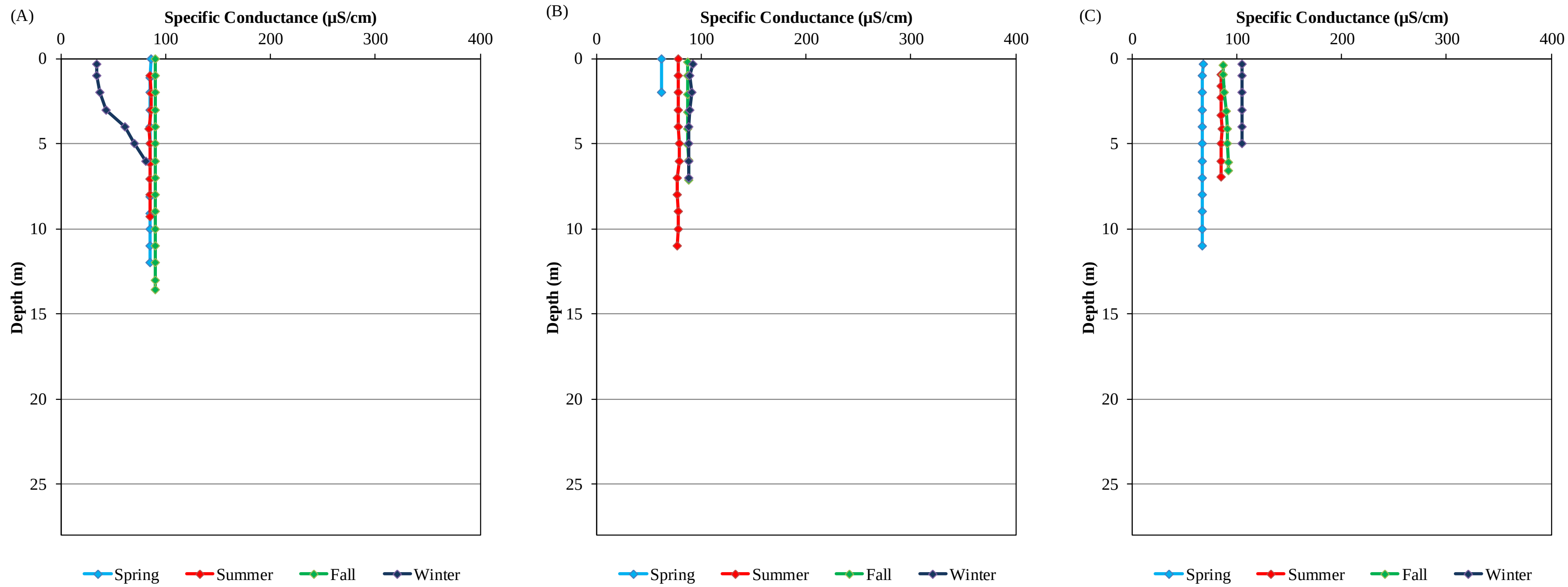


Figure 5.3.4-25. Specific conductance depth profiles measured at Granville Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

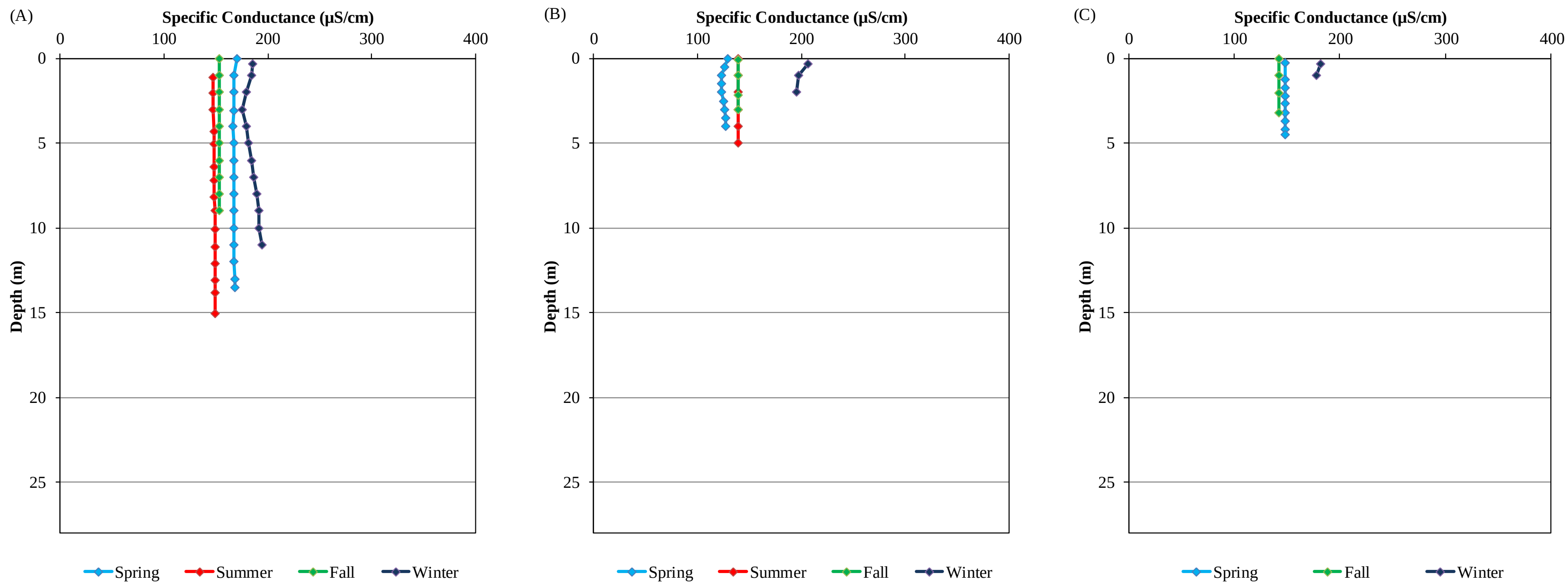


Figure 5.3.4-26. Specific conductance depth profiles measured at Gauer Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

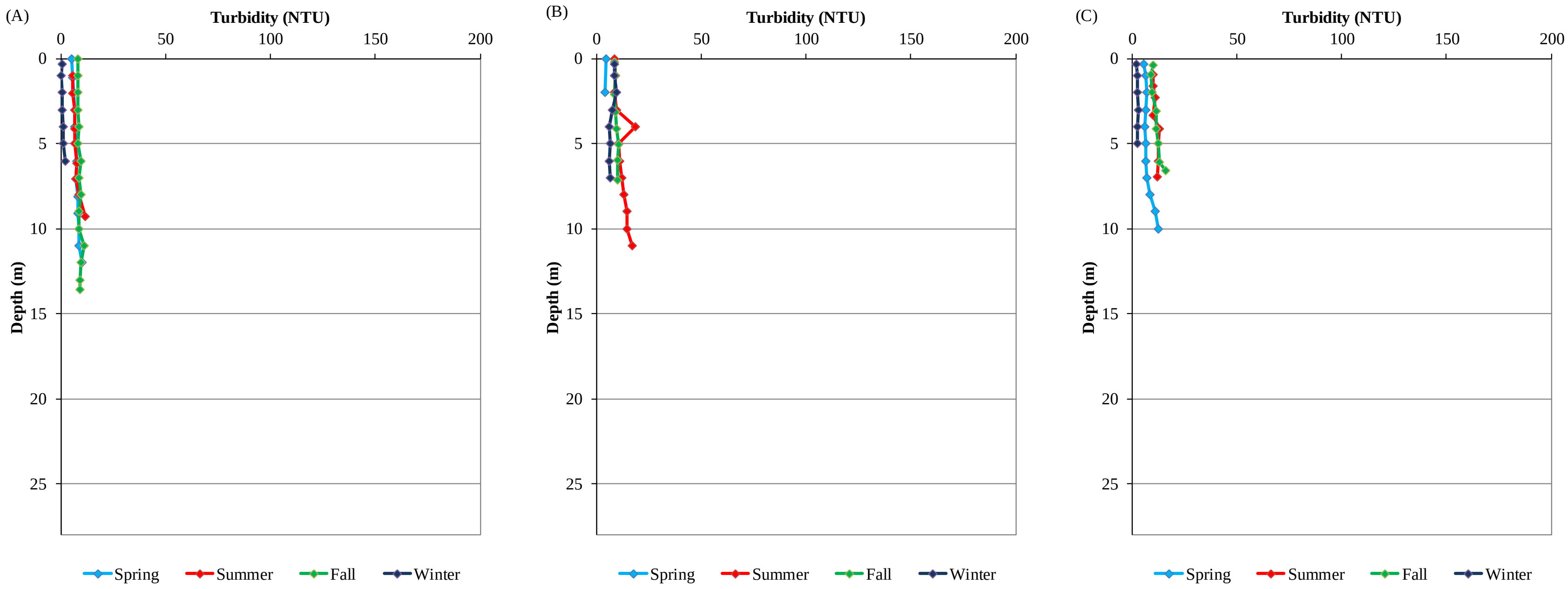


Figure 5.3.4-27. Turbidity depth profiles measured in Granville Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

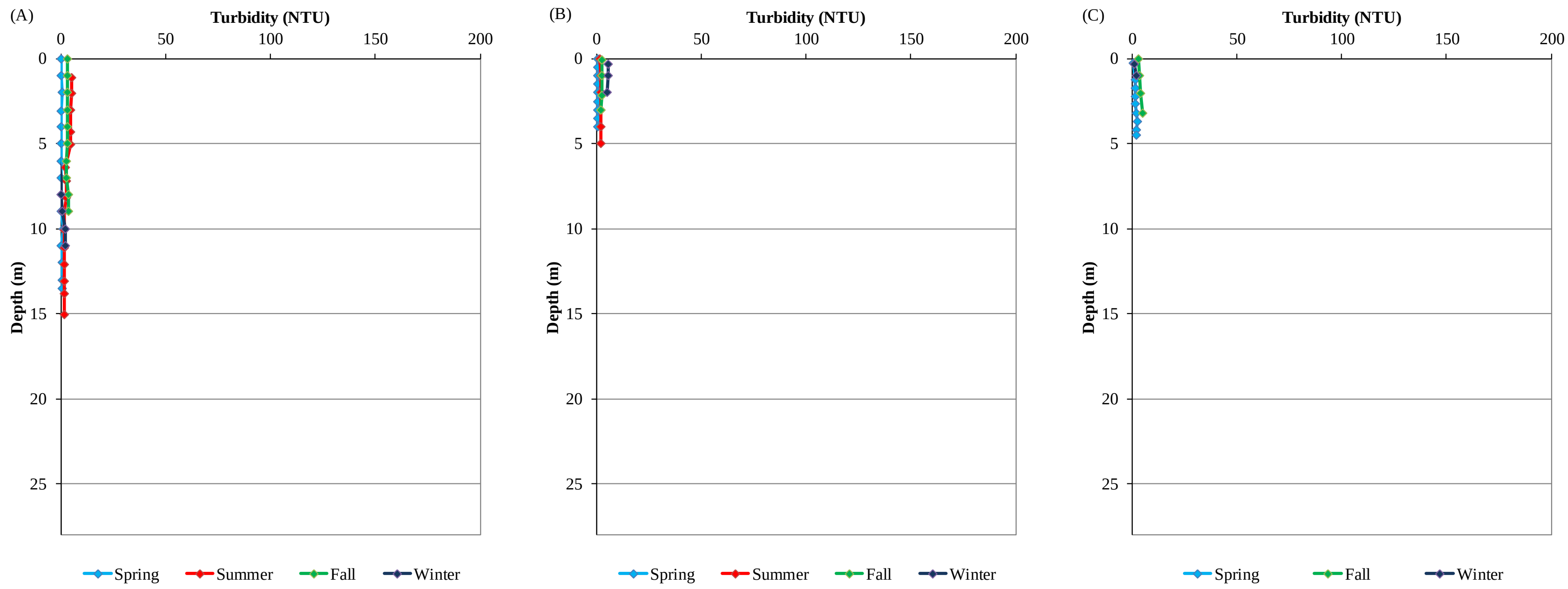


Figure 5.3.4-28. Turbidity depth profiles measured in Gauer Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

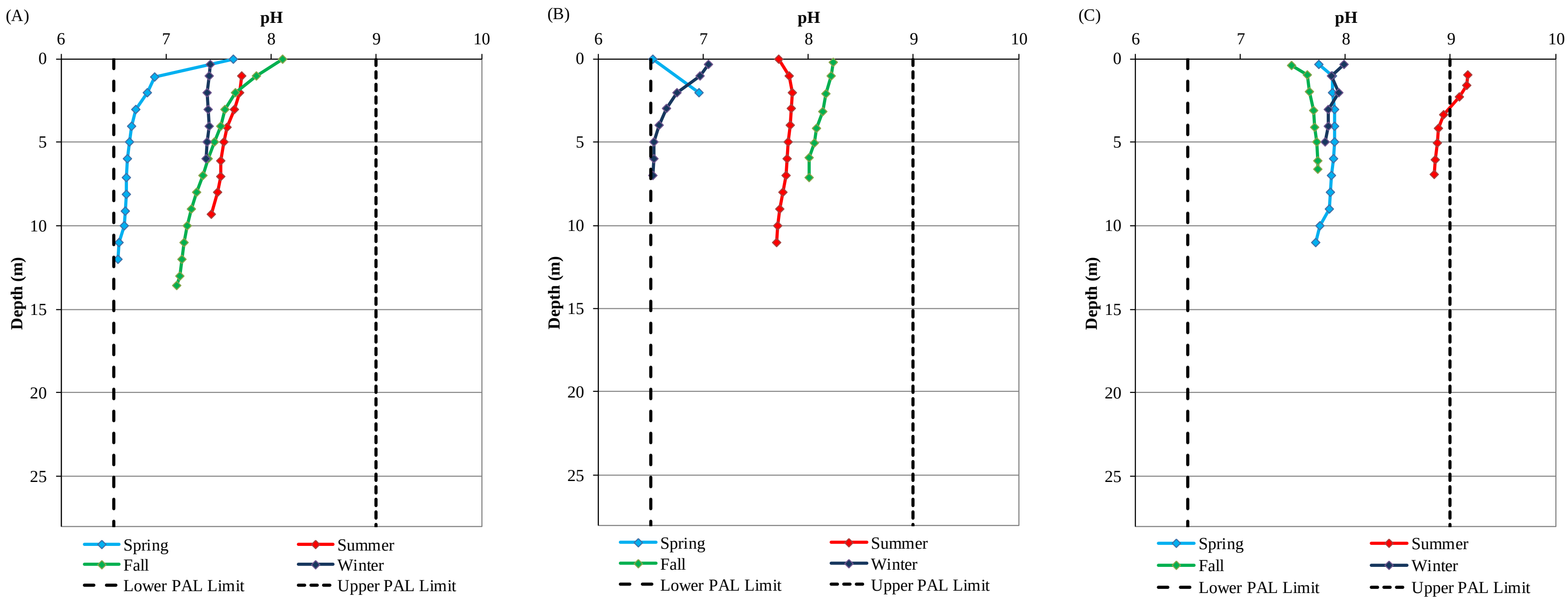


Figure 5.3.4-29. pH depth profiles measured in Granville Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

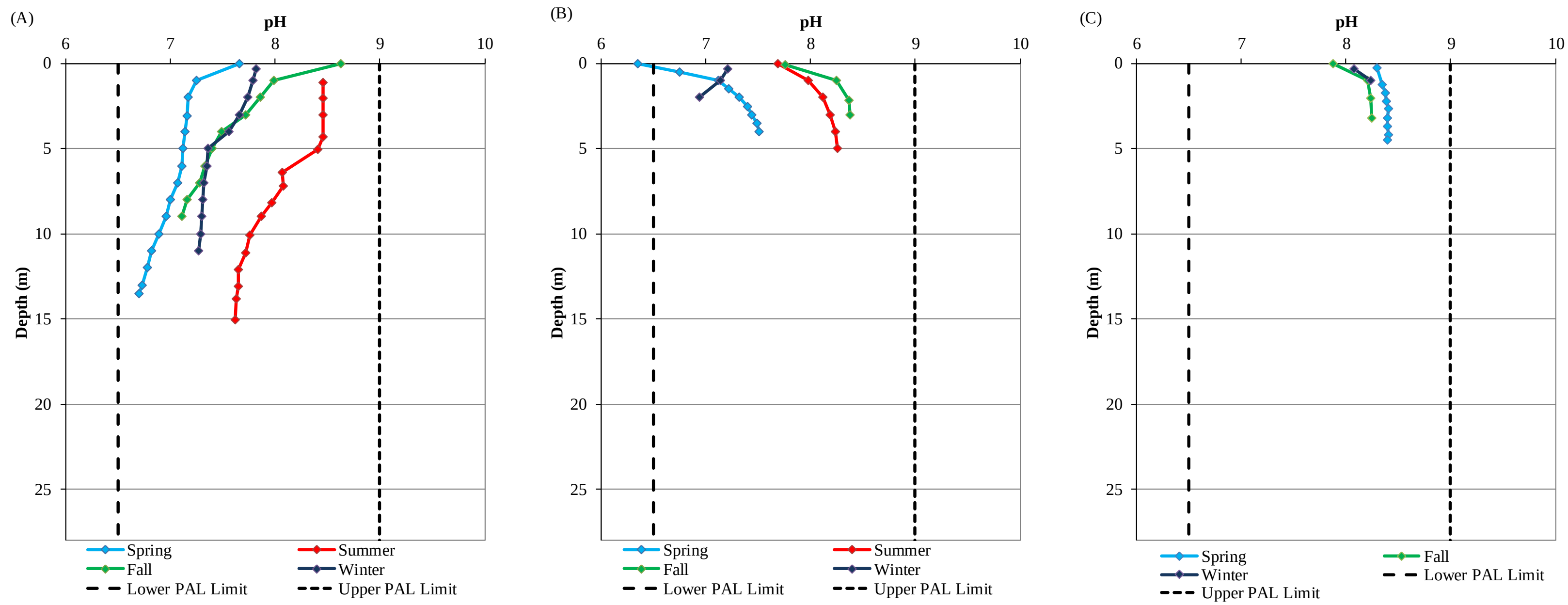


Figure 5.3.4-30. pH depth profiles measured in Gauer Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

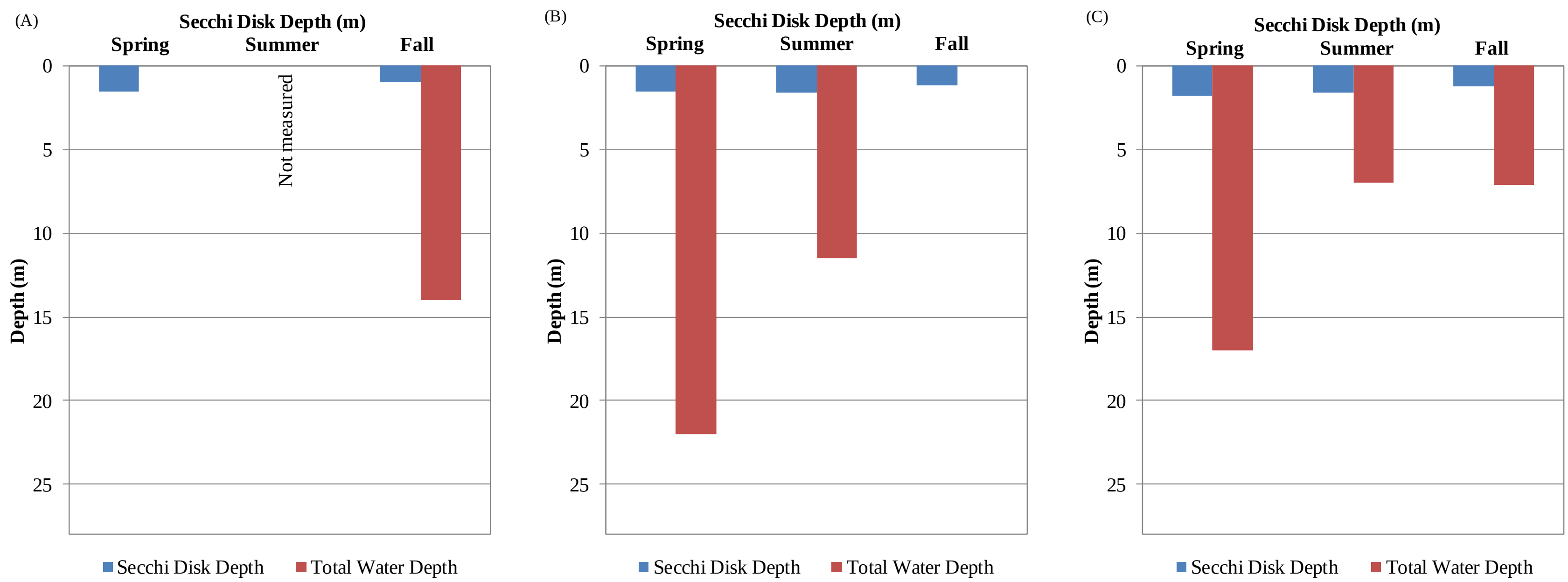


Figure 5.3.4-31. Secchi disk depths measured in Granville Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

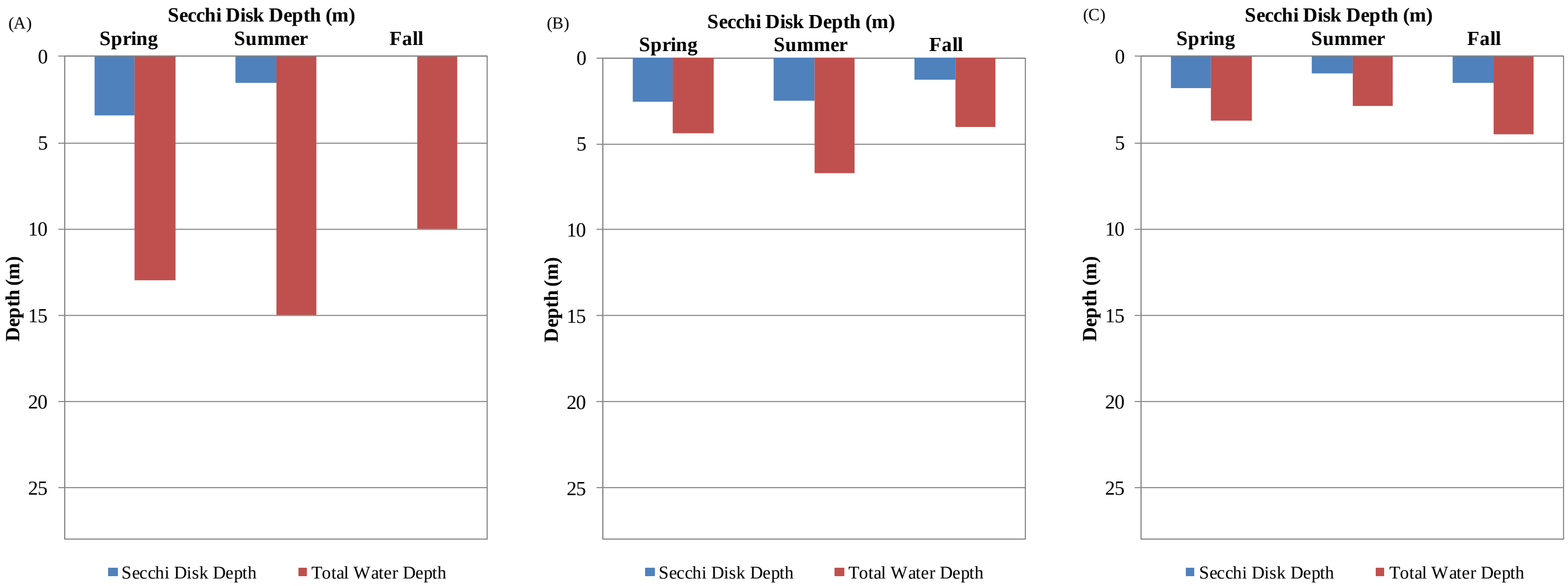


Figure 5.3.4-32. Secchi disk depths measured in Gauer Lake: (A) 2008/2009; (B) 2009/2010; and (C) 2010/2011.

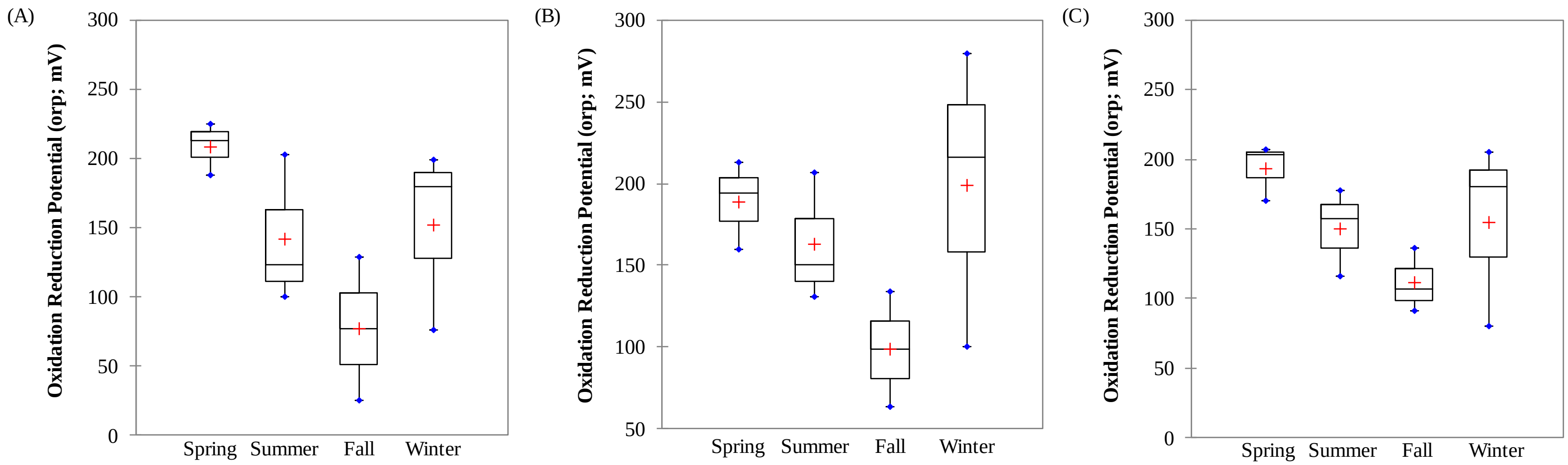


Figure 5.3.4-33. Oxidation-reduction potential in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. There were no significant differences between seasons.

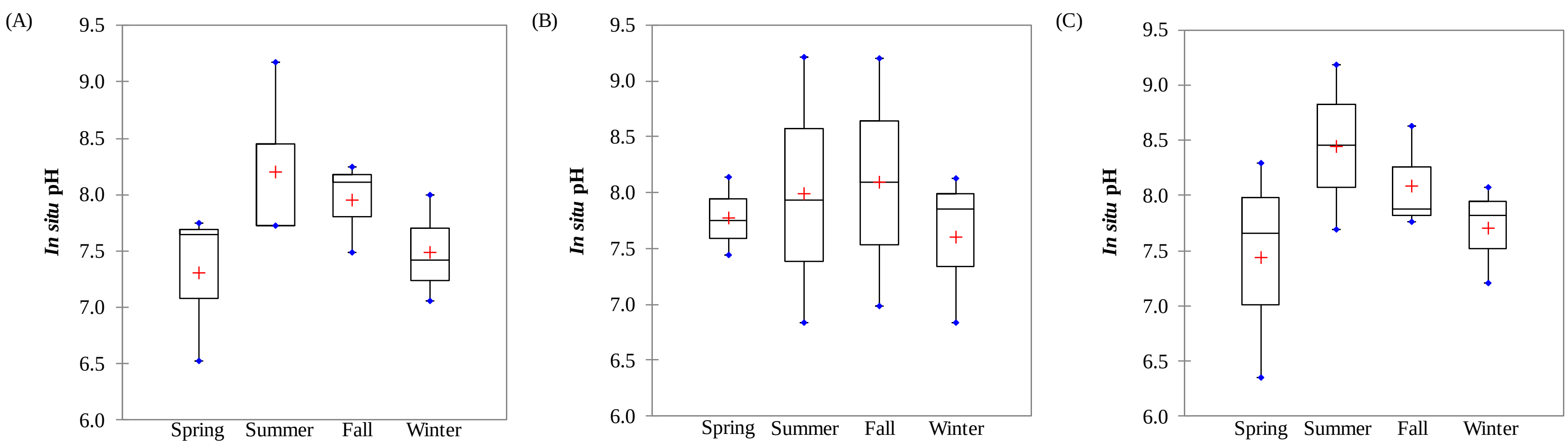


Figure 5.3.4-34. *In situ* pH in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. There were no significant differences between seasons.

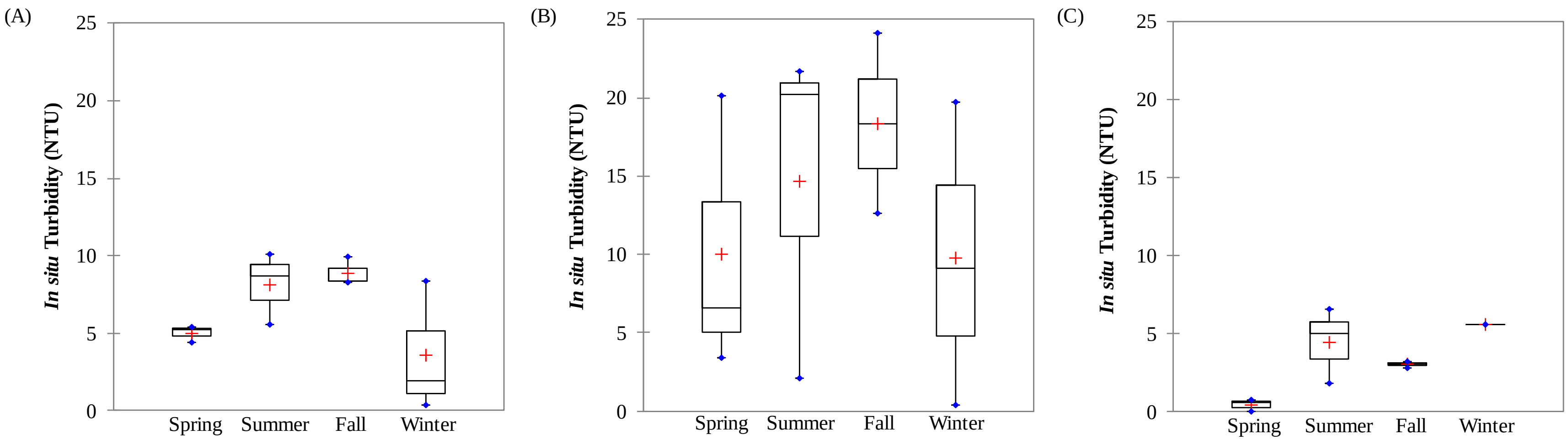


Figure 5.3.4-35. Turbidity the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. There were no significant differences between seasons.

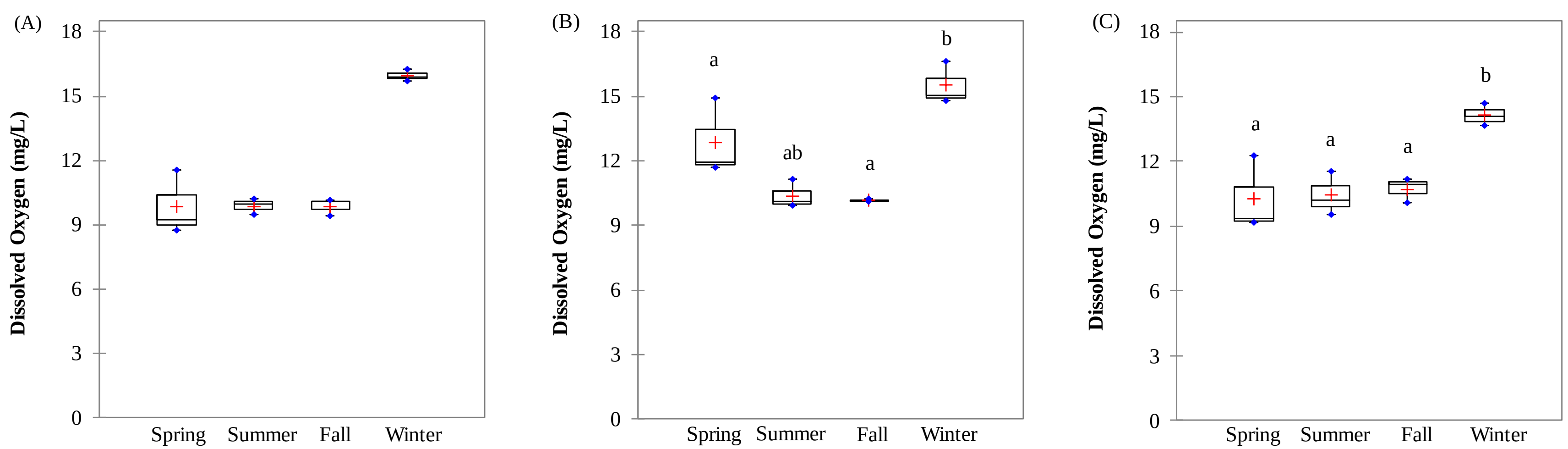


Figure 5.3.4-36. Dissolved oxygen in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

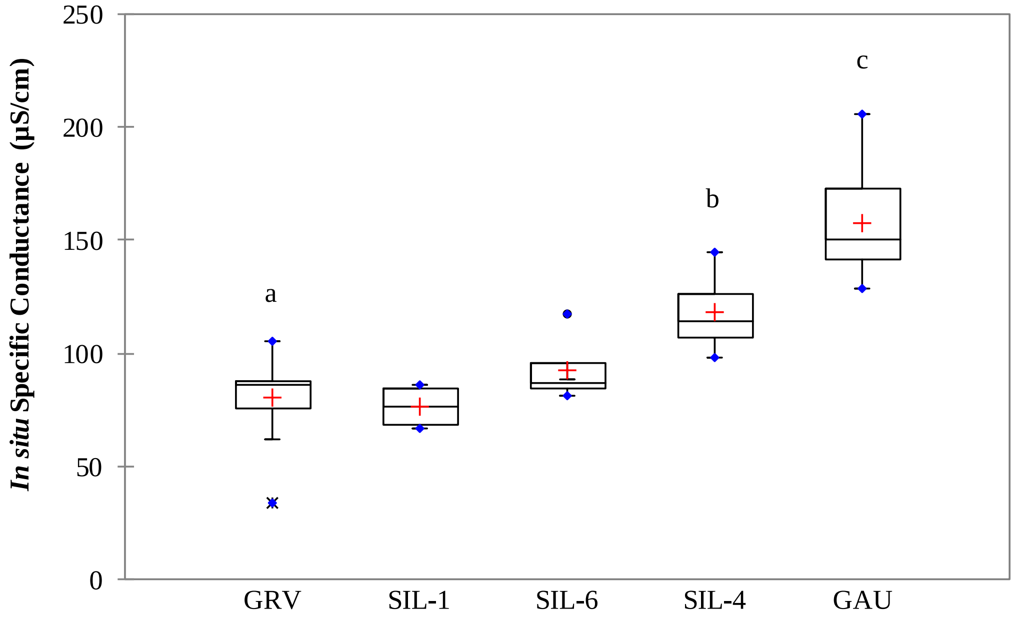


Figure 5.3.4-37. *In situ* specific conductance in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant spatial differences are denoted with different superscripts.

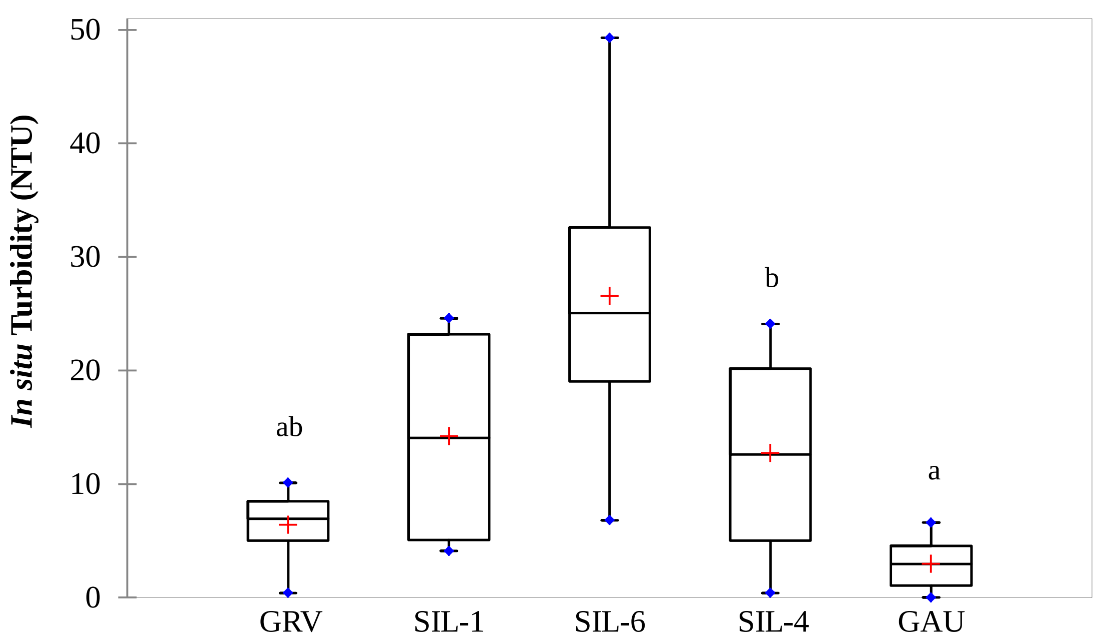


Figure 5.3.4-38. *In situ* turbidity in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant spatial differences are denoted with different superscripts.

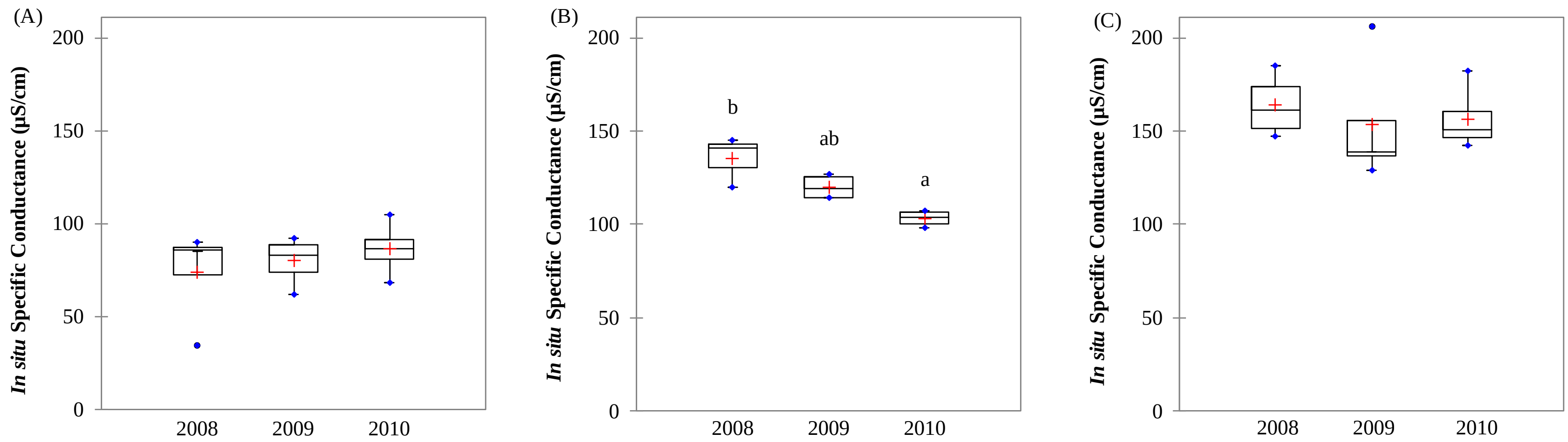


Figure 5.3.4-39. *In situ* specific conductance in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant differences are denoted with different superscripts.

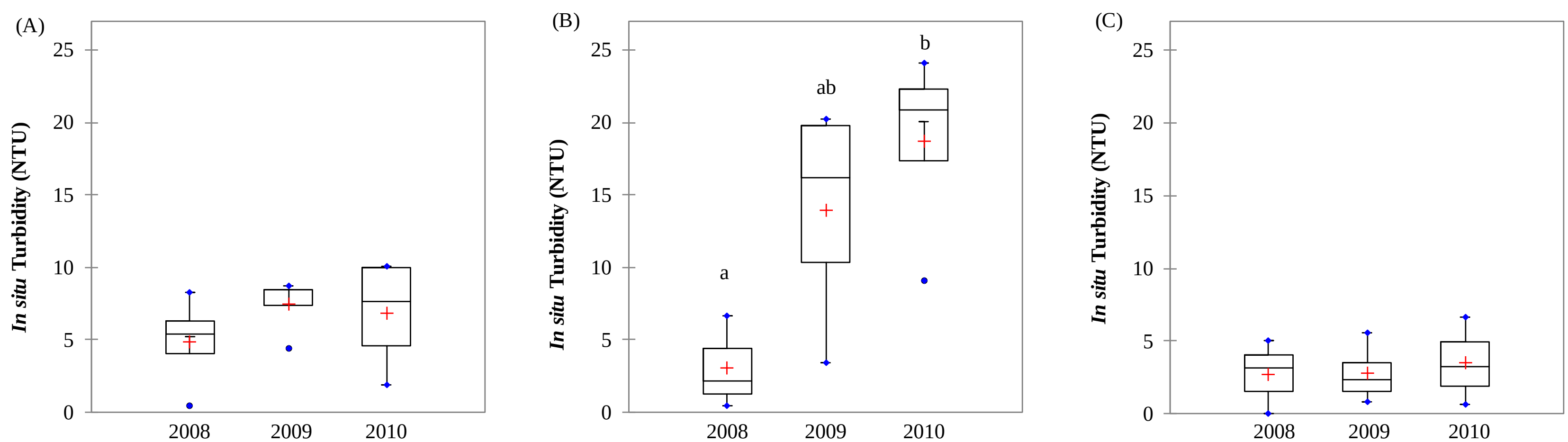


Figure 5.3.4-40. *In situ* turbidity in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant differences are denoted with different superscripts.

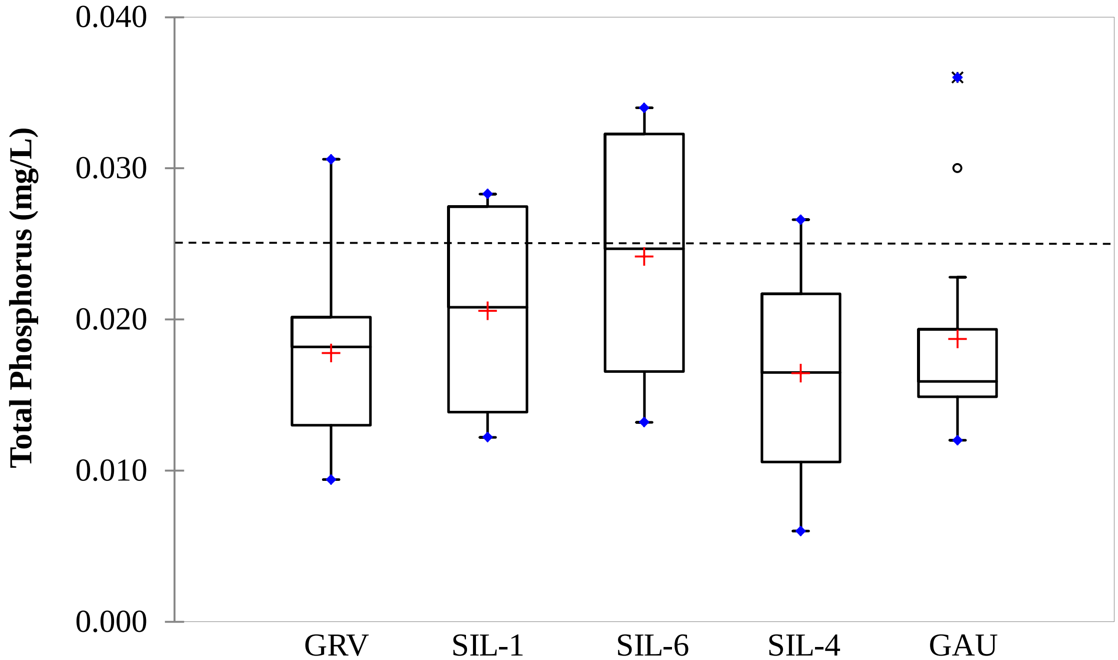


Figure 5.3.4-41. Total phosphorus in the Upper Churchill River Region: 2008-2010. The dashed line represents the Manitoba narrative guideline for lakes, ponds, and reservoirs.

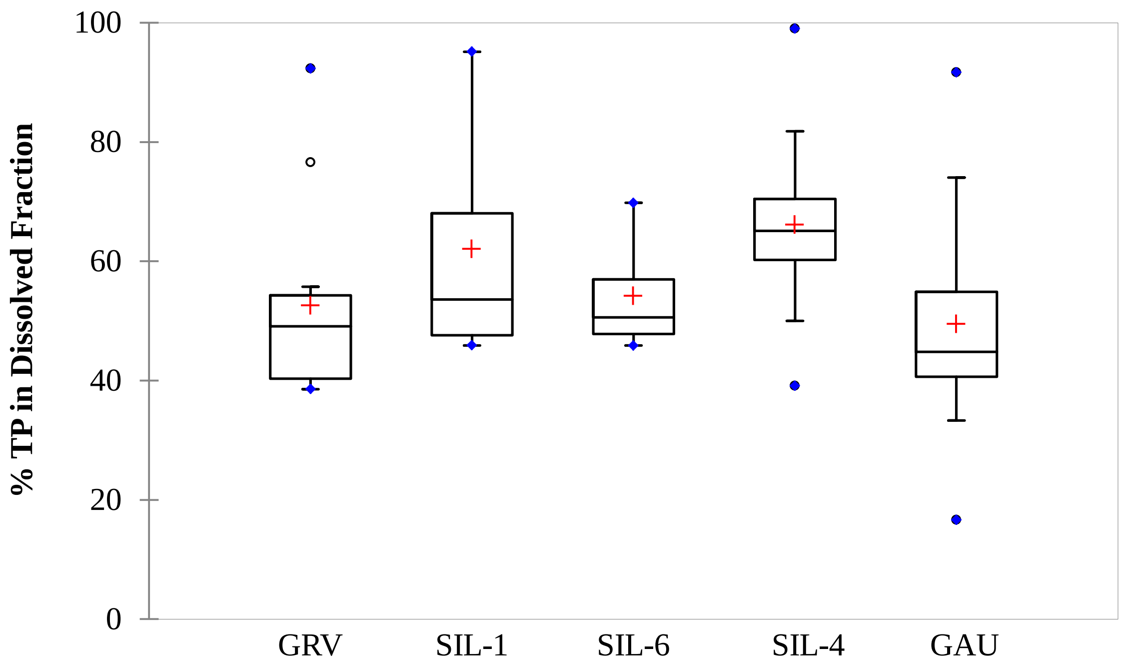


Figure 5.3.4-42. Fraction of total phosphorus in dissolved form in Upper Churchill River Region: 2008-2010.

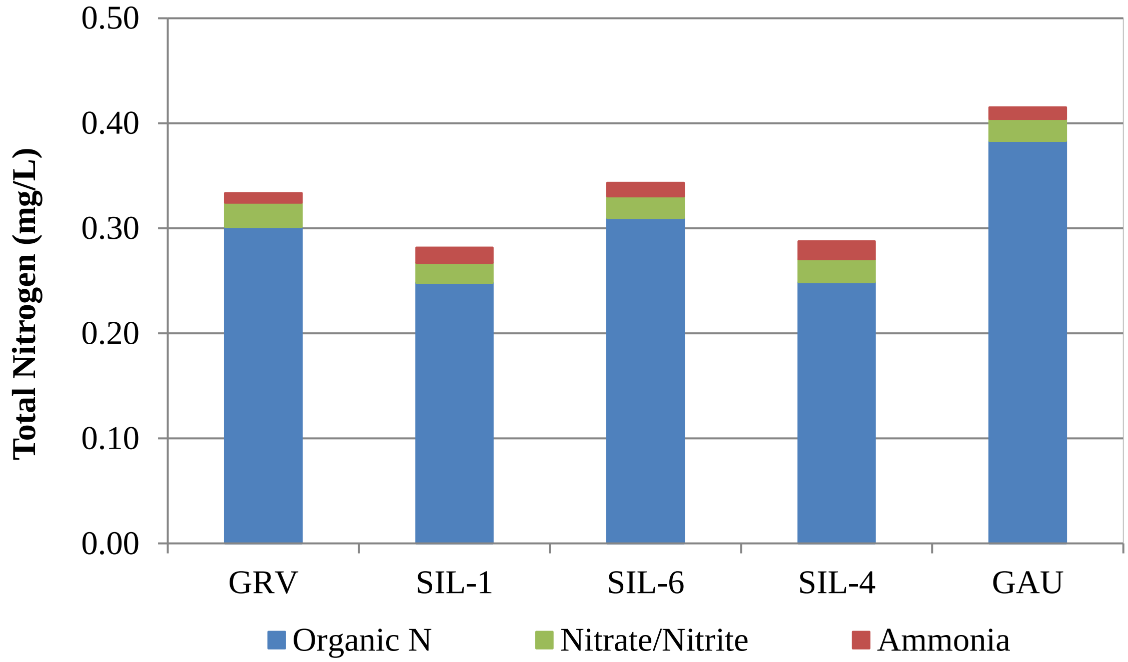


Figure 5.3.4-43. Composition of total nitrogen as organic nitrogen, nitrate/nitrite, and ammonia in the Upper Churchill River Region.

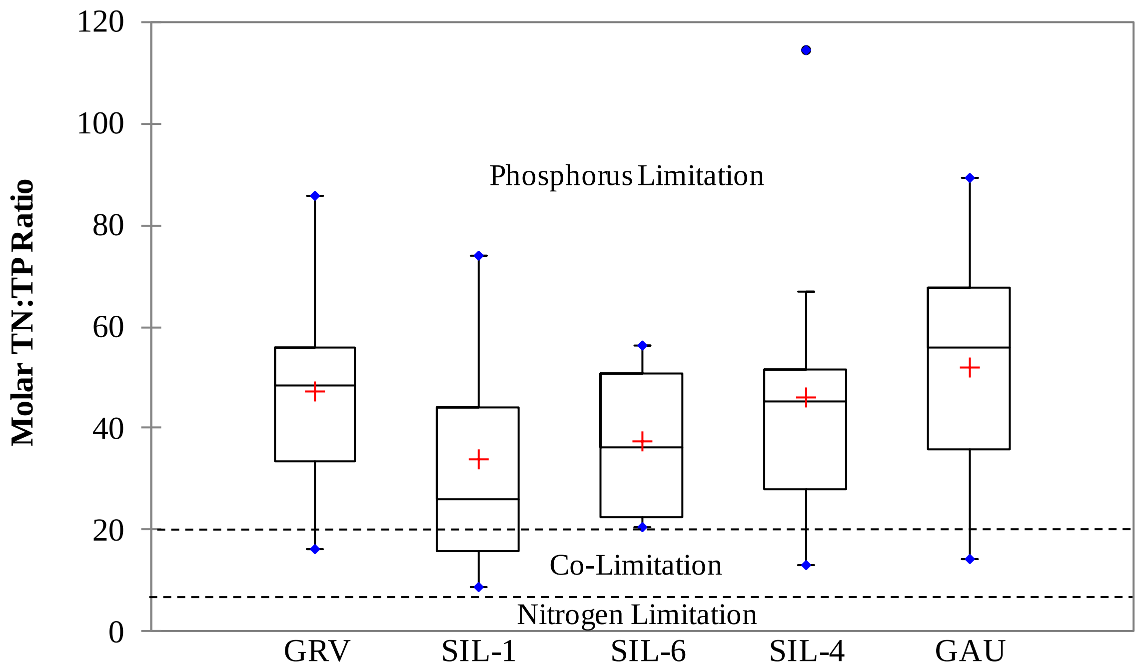


Figure 5.3.4-44. Total nitrogen to total phosphorus molar ratios in the Upper Churchill River Region.

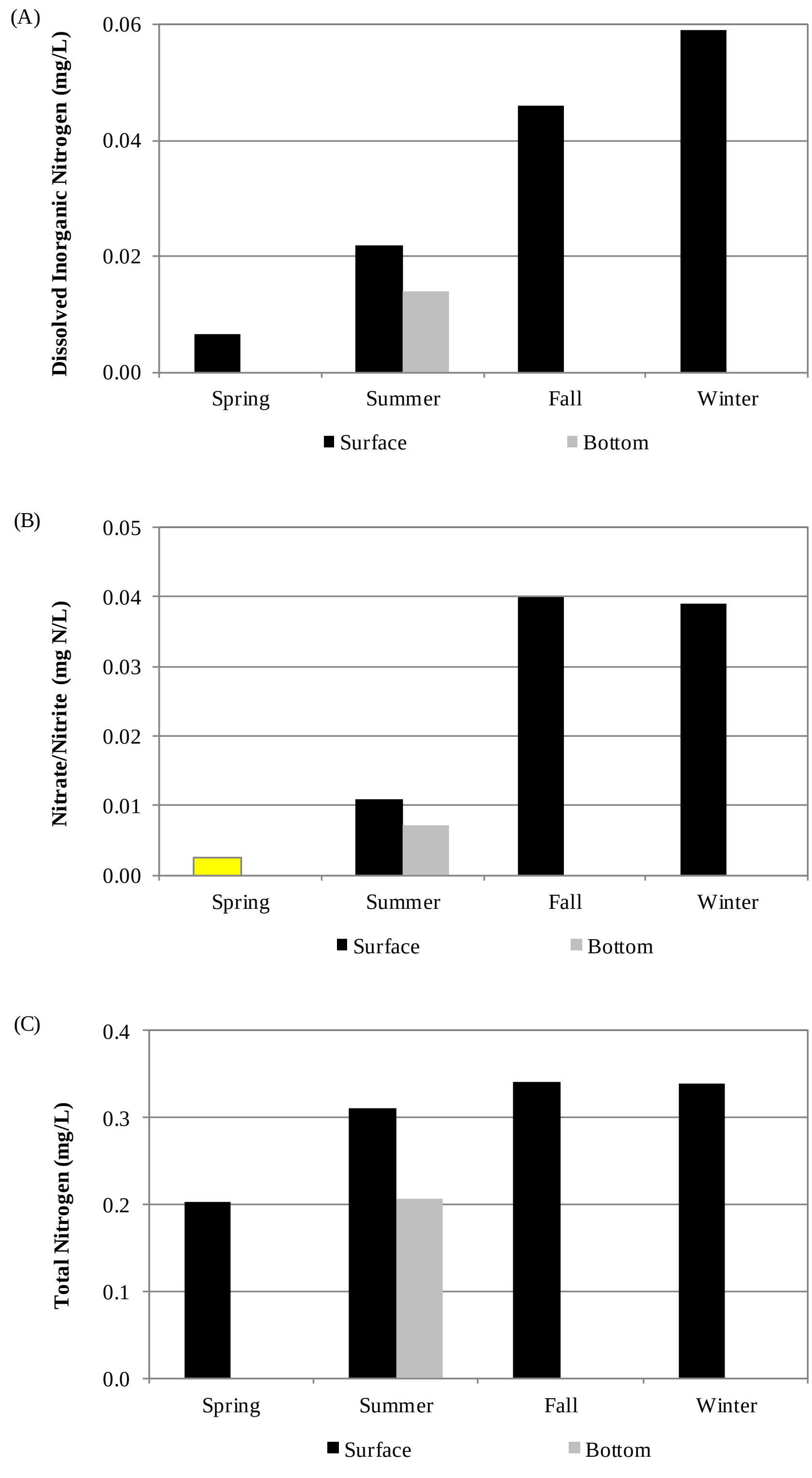
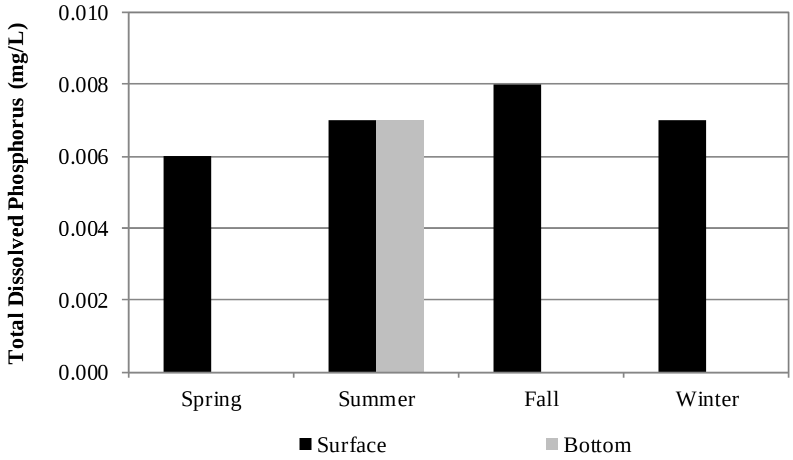
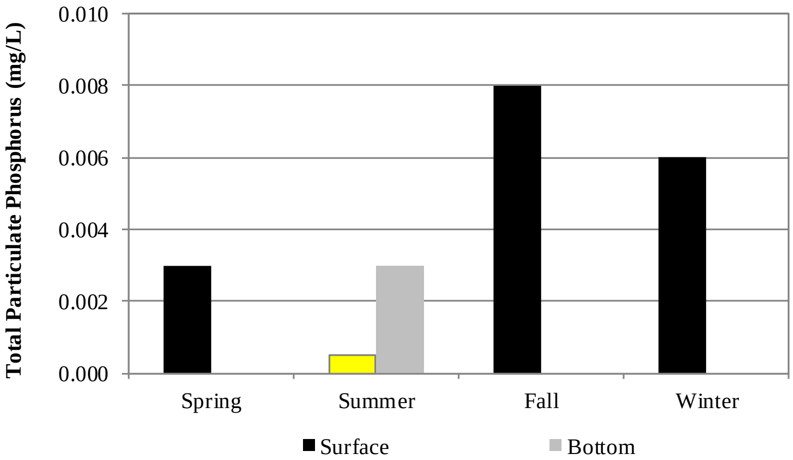


Figure 5.3.4-45. Dissolved inorganic nitrogen (A), nitrate/nitrite (B), and total nitrogen (C) measured in surface grabs and bottom samples in Southern Indian Lake-Area 4, 2008/2009. Yellow bars indicate values below the analytical detection limit.

(A)



(B)



(C)

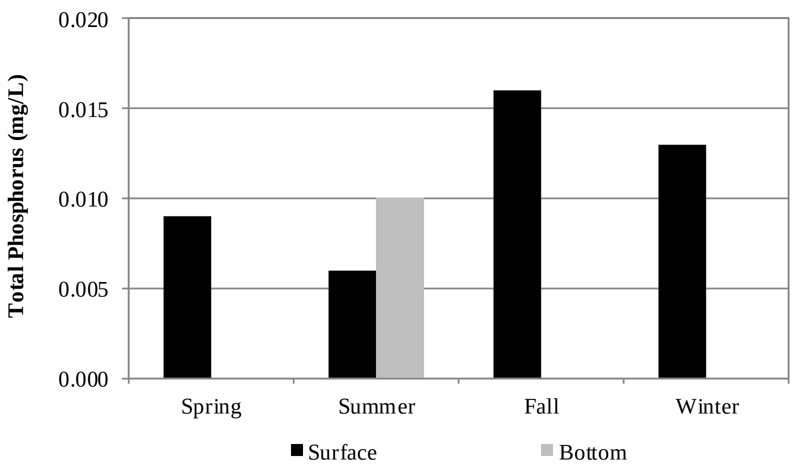


Figure 5.3.4-46. Total dissolved phosphorus (A), total particulate phosphorus (B), and total phosphorus (C) measured in surface grabs and bottom samples in Southern Indian Lake-Area 4, 2008/2009. Yellow bars indicate values below the analytical detection limit.

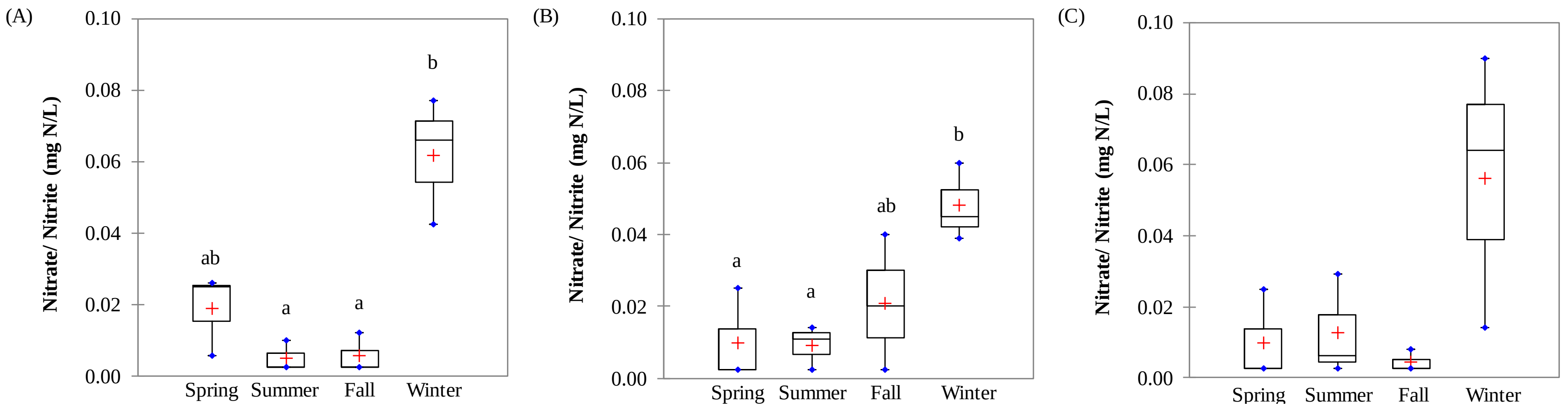


Figure 5.3.4-47. Nitrate/nitrite in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

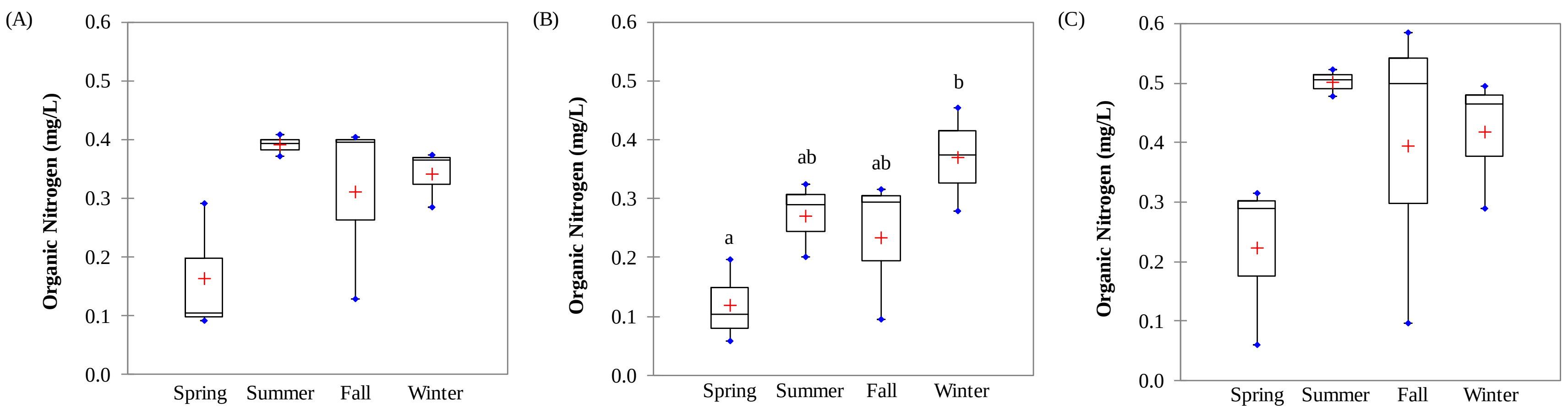


Figure 5.3.4-48. Organic nitrogen in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

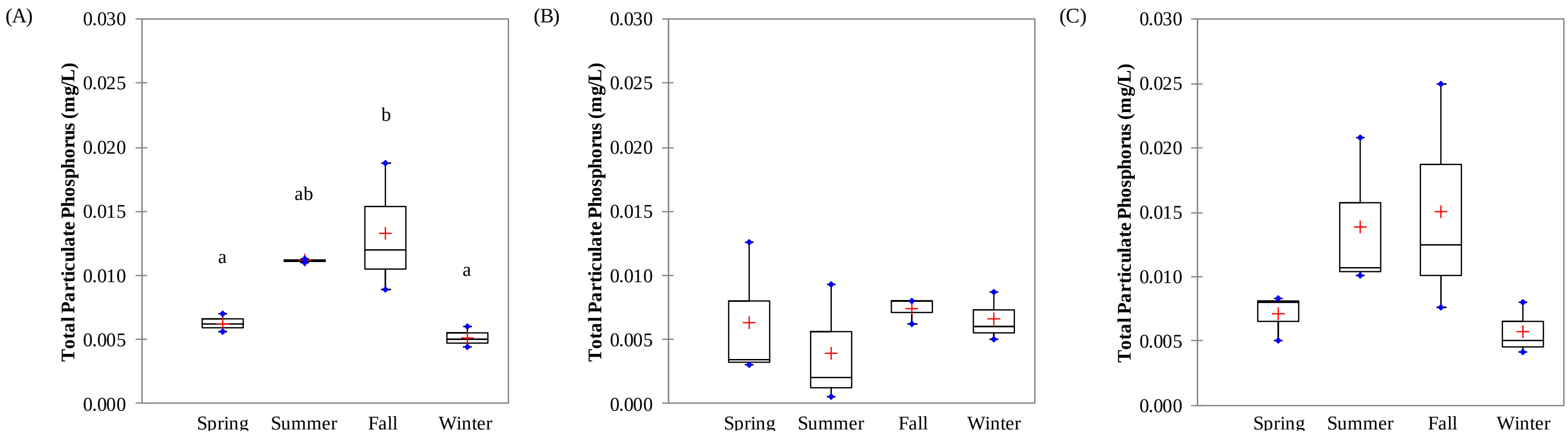


Figure 5.3.4-49. Total particulate phosphorus in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

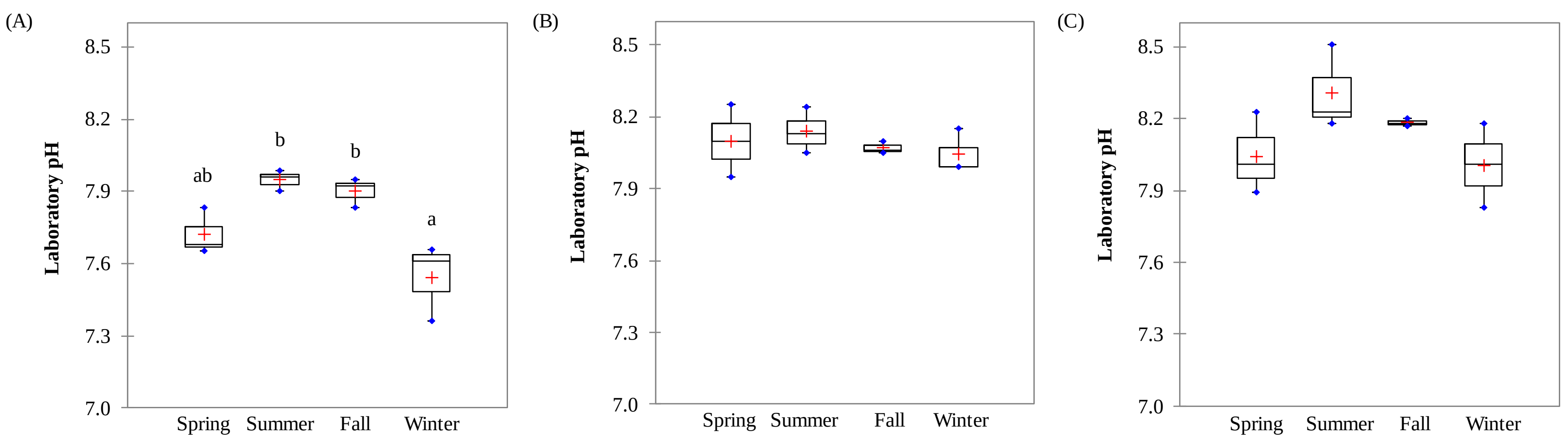


Figure 5.3.4-50. Laboratory pH in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

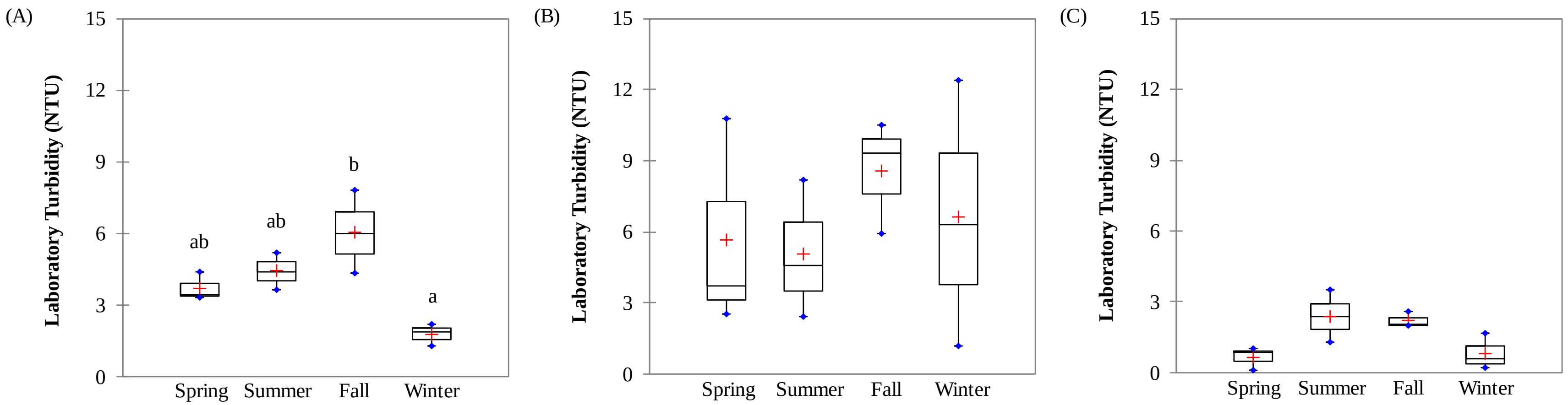


Figure 5.3.4-51. Laboratory turbidity in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

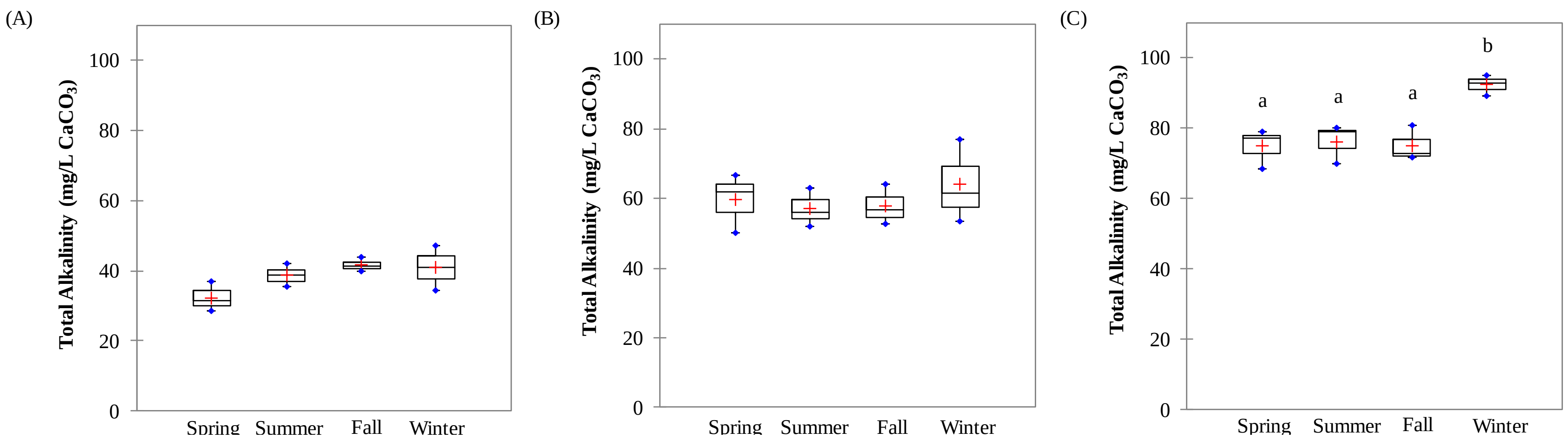


Figure 5.3.4-52. Total alkalinity in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

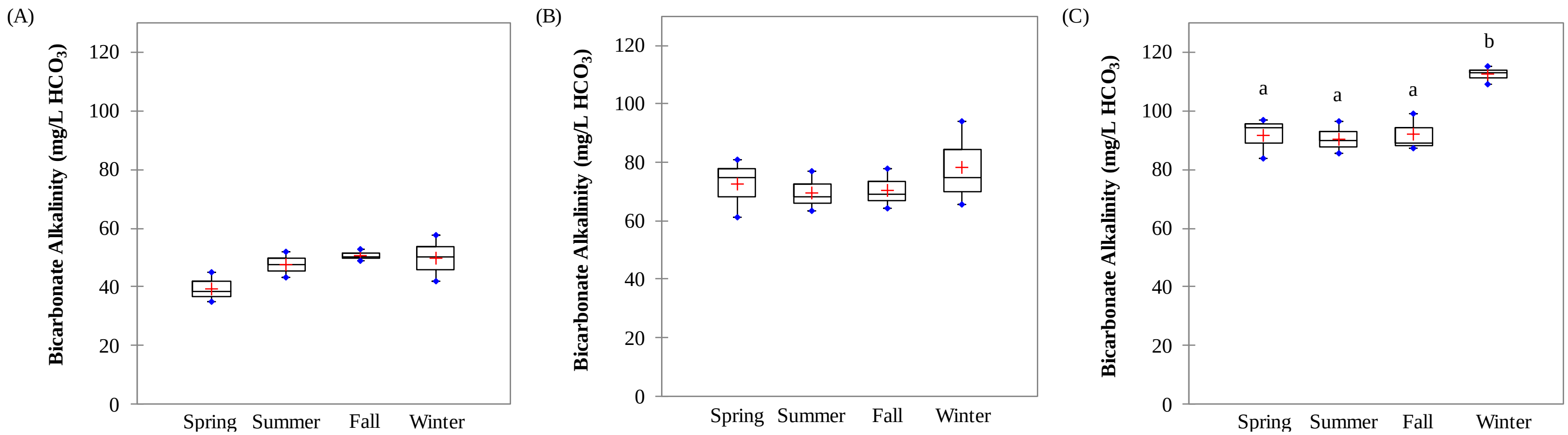


Figure 5.3.4-53. Bicarbonate alkalinity in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

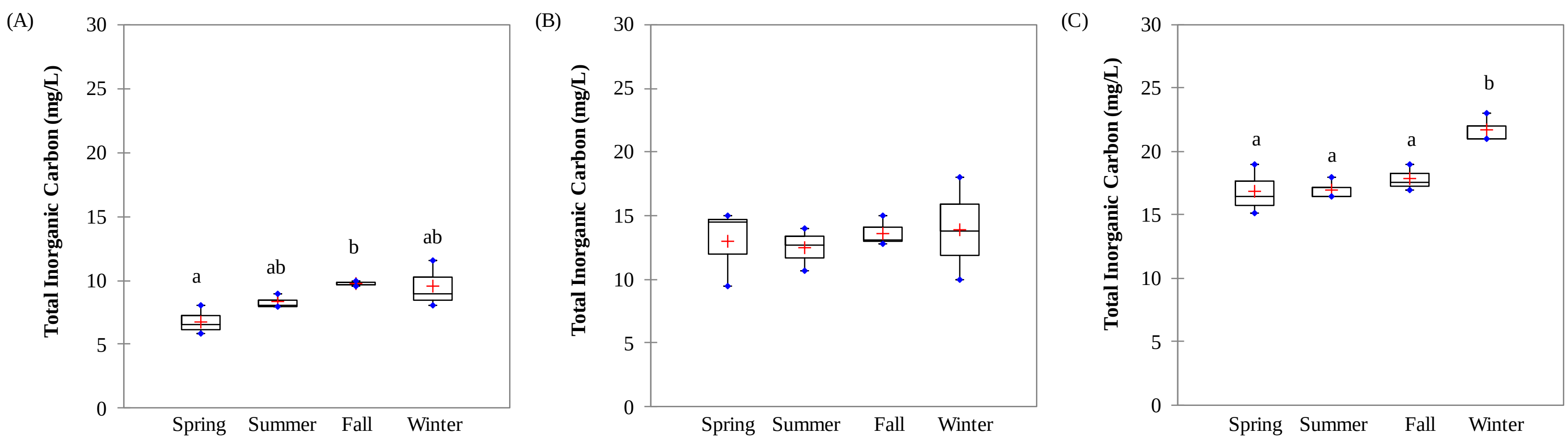


Figure 5.3.4-54. Total inorganic carbon in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

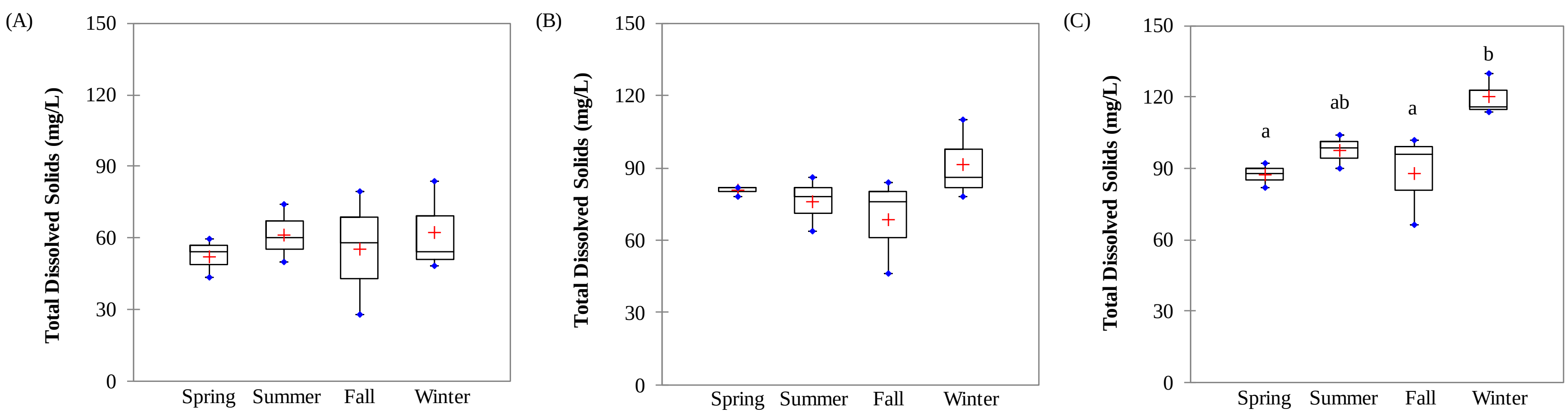


Figure 5.3.4-55. Total dissolved solids in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

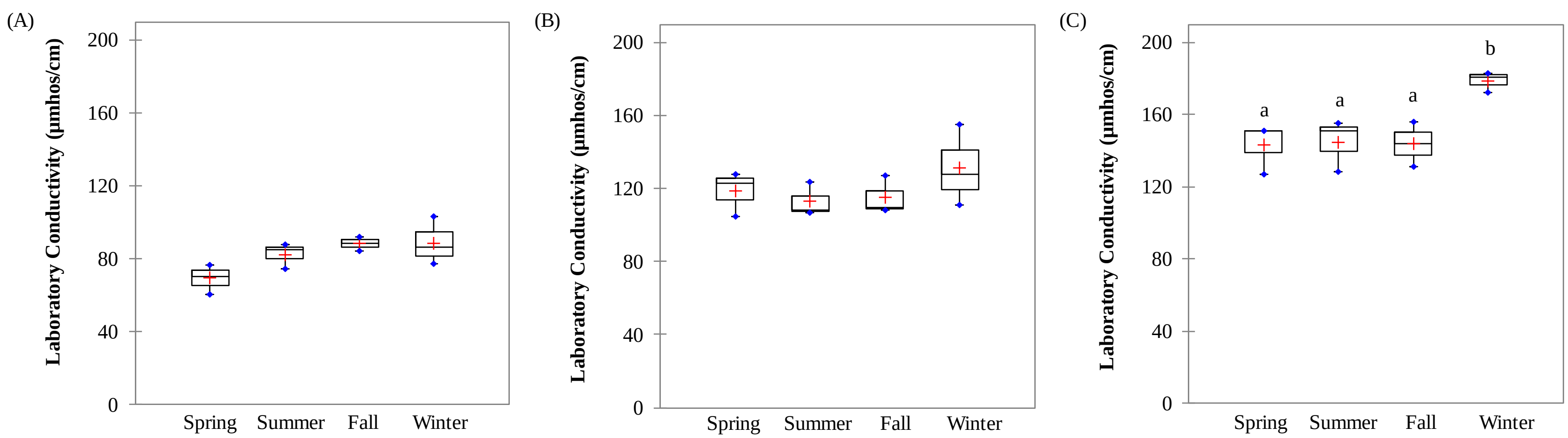


Figure 5.3.4-56. Laboratory conductivity in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

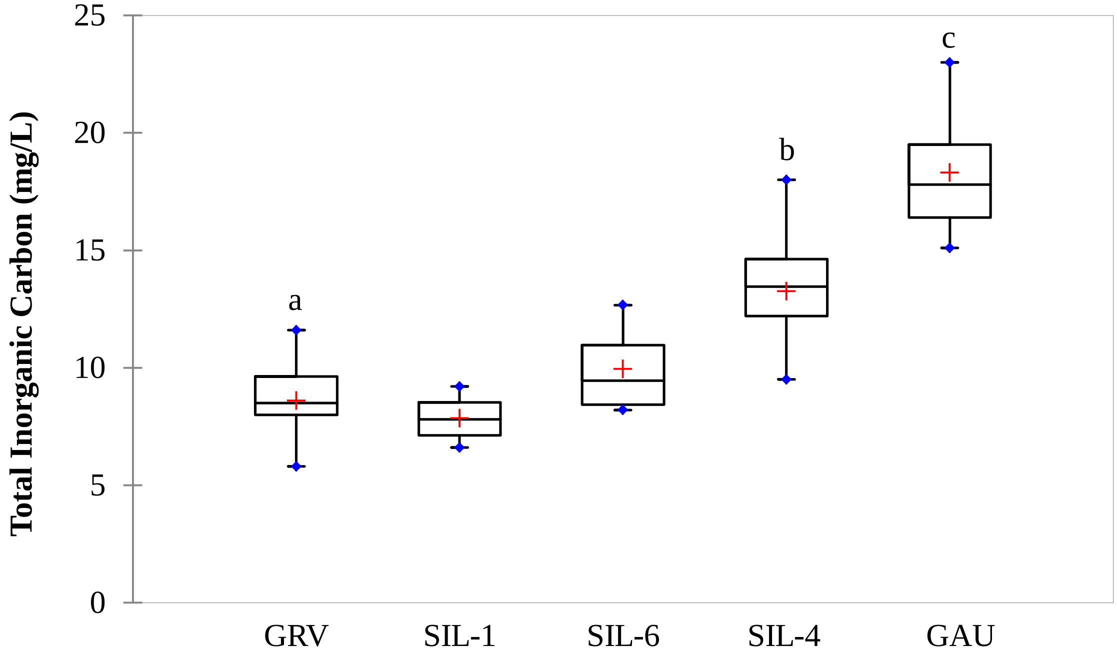


Figure 5.3.4-57. Total inorganic carbon in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

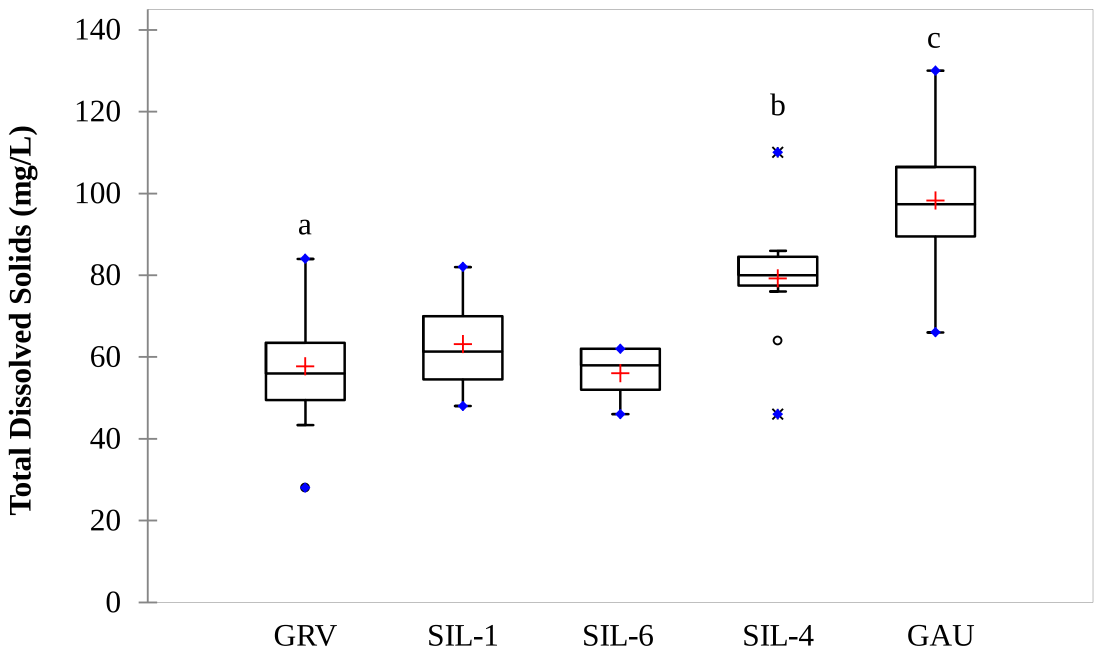


Figure 5.3.4-58. Total dissolved solids in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

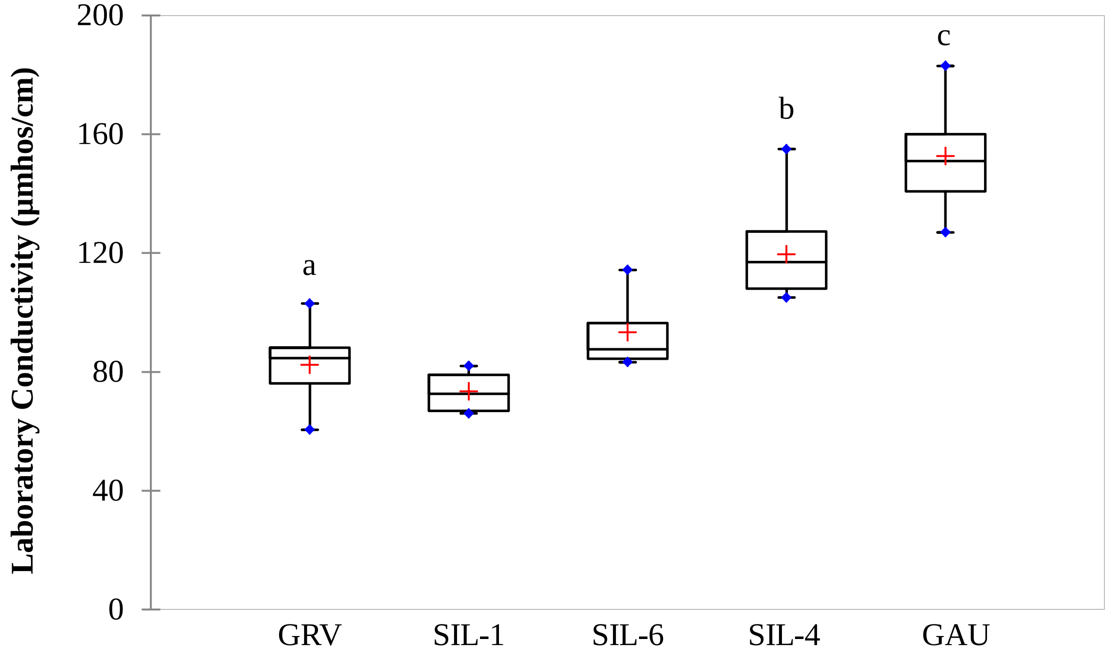


Figure 5.3.4-59. Laboratory conductivity in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

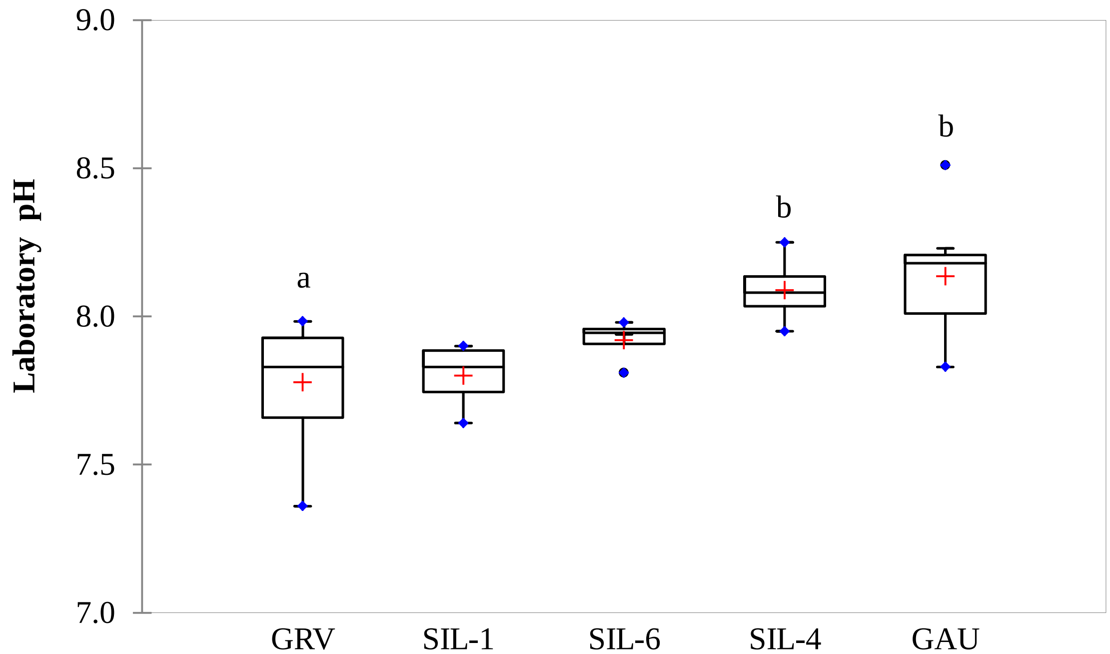


Figure 5.3.4-60. Laboratory pH in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

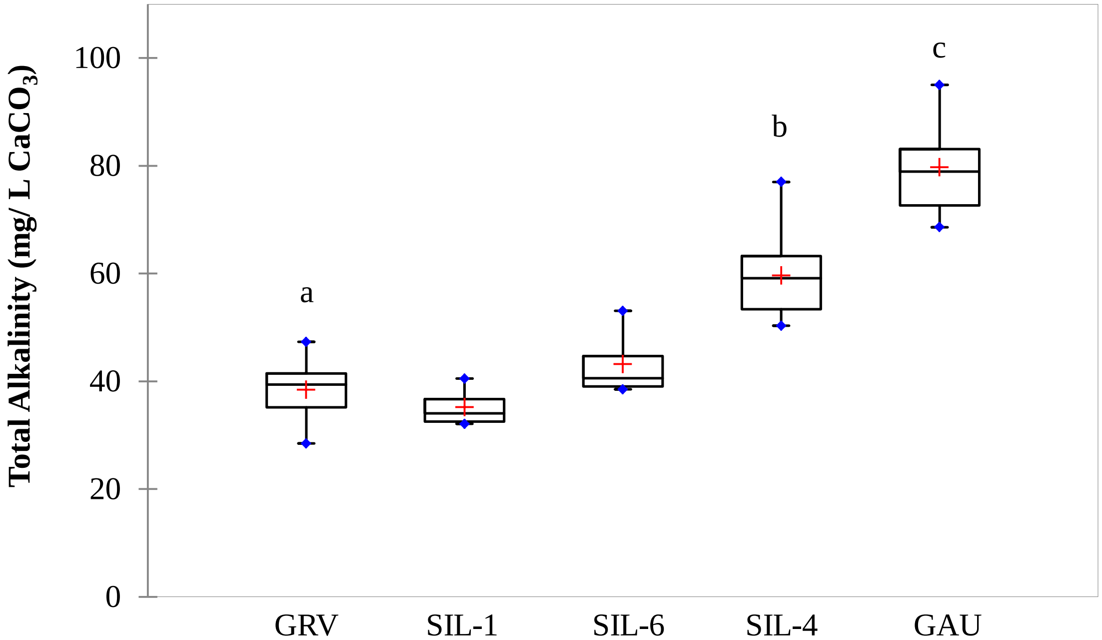


Figure 5.3.4-61. Total alkalinity the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

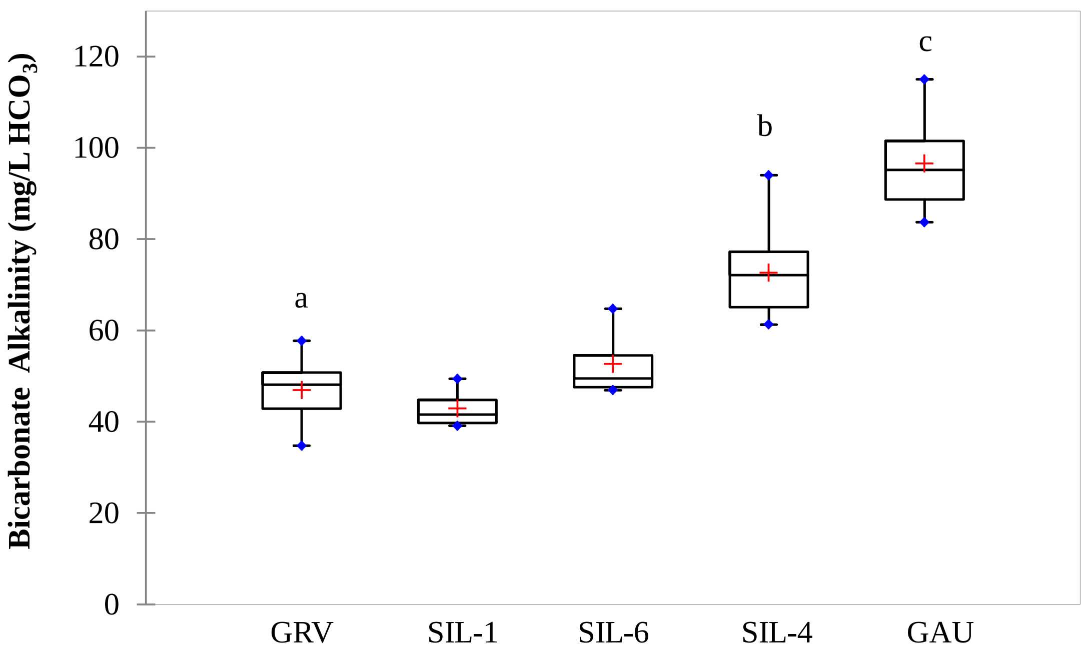


Figure 5.3.4-62. Bicarbonate alkalinity in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

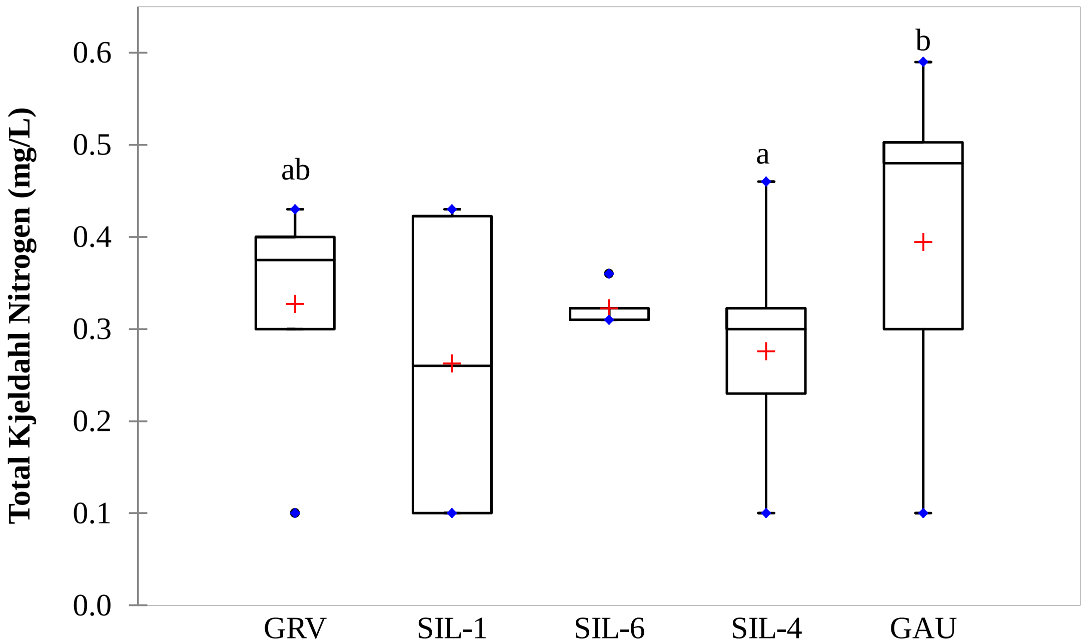


Figure 5.3.4-63. Total Kjeldahl nitrogen in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

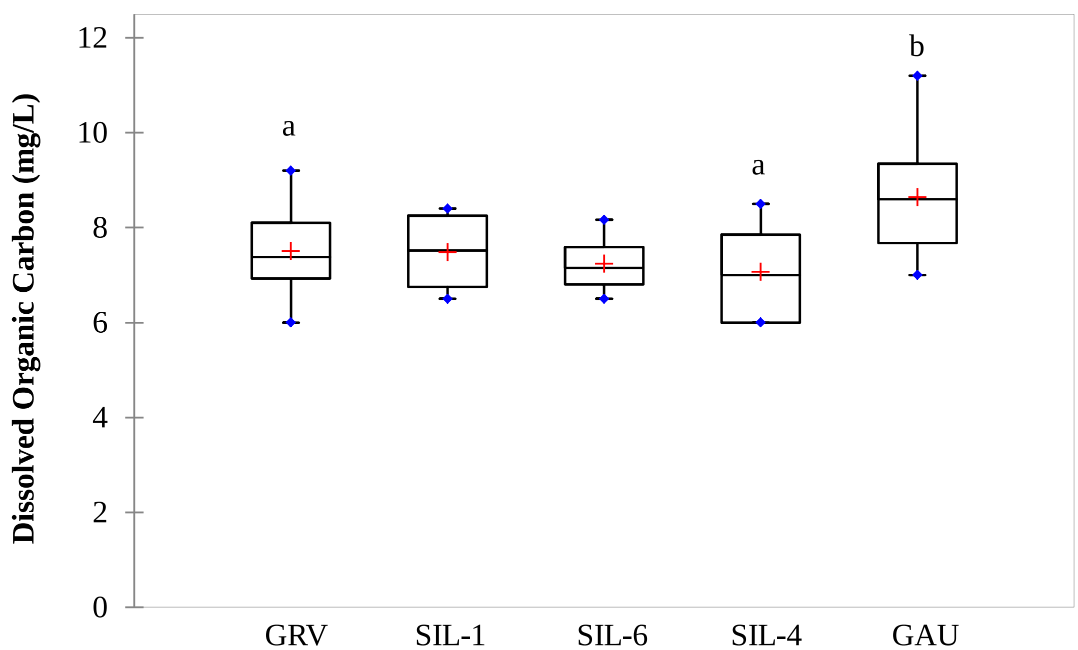


Figure 5.3.4-64. Dissolved organic carbon in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

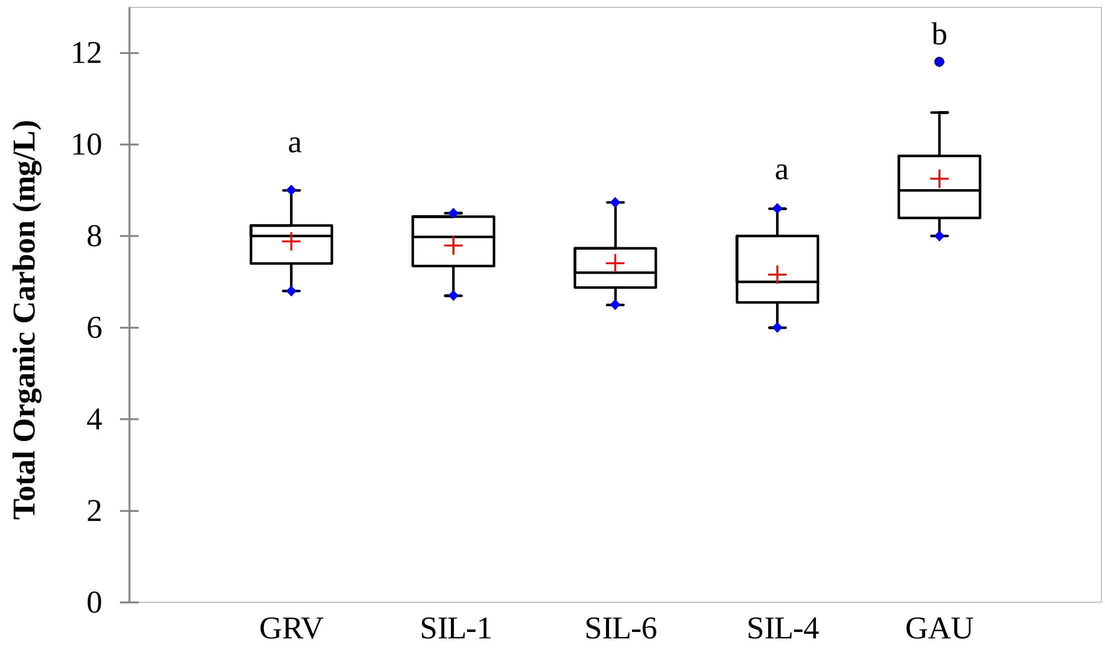


Figure 5.3.4-65. Total organic carbon measured in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

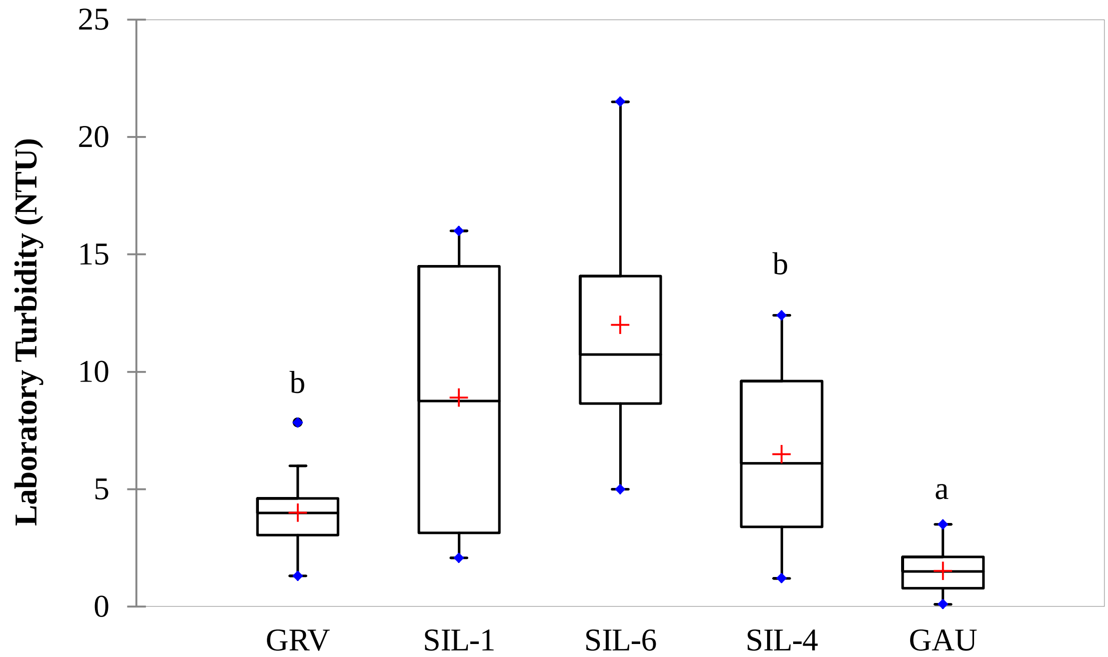


Figure 5.3.4-66. Laboratory turbidity measured in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

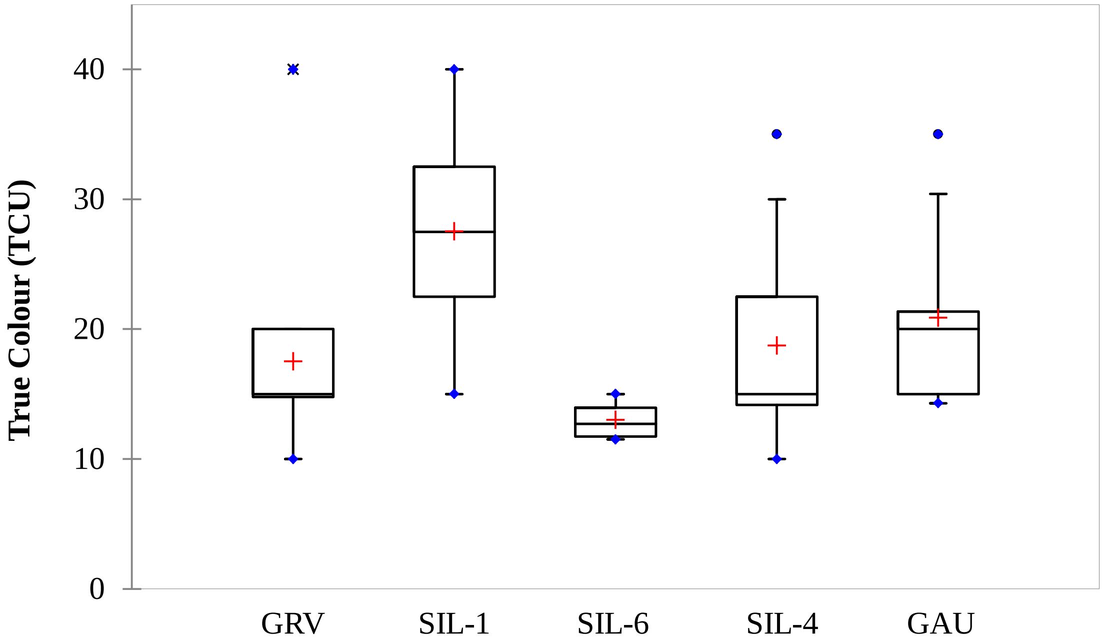


Figure 5.3.4-67. True color in the Upper Churchill River Region: 2008-2010.

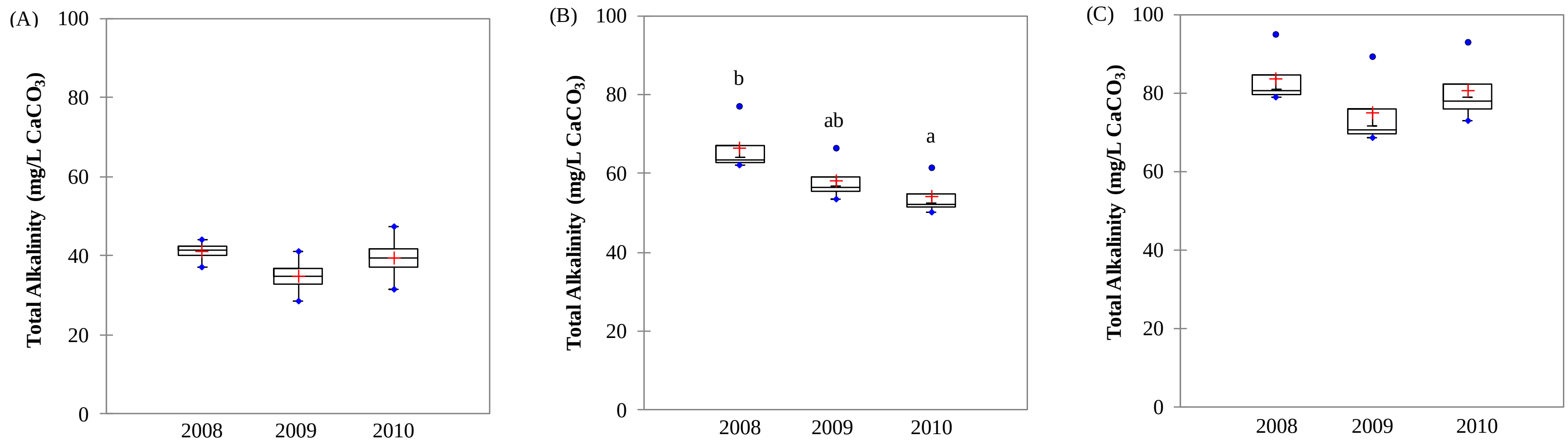


Figure 5.3.4-68. Total alkalinity in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant differences are denoted with different superscripts.

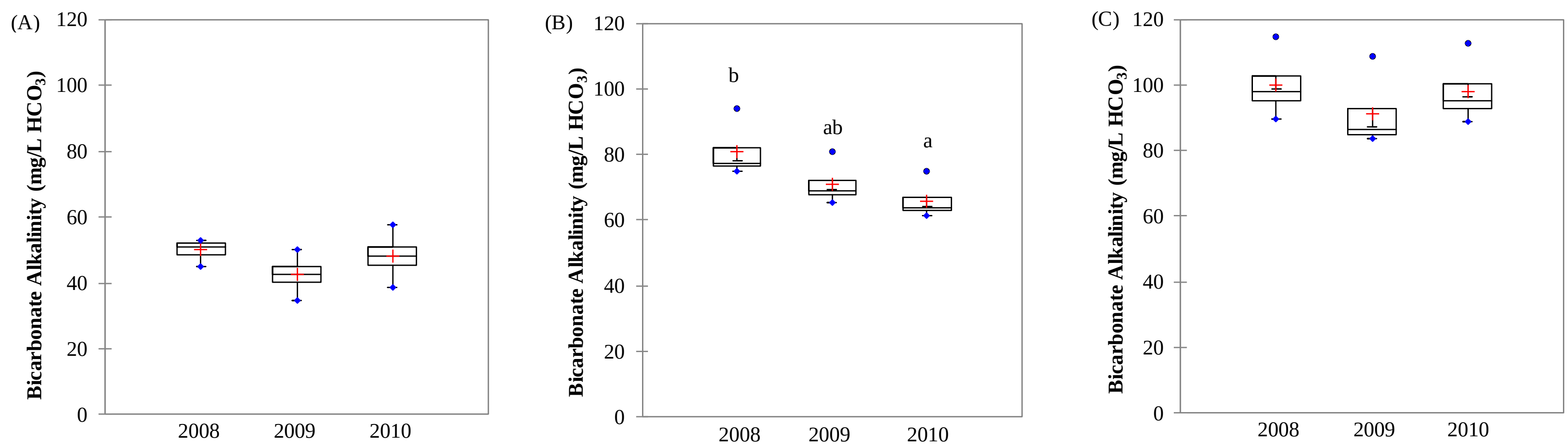


Figure 5.3.4-69. Bicarbonate alkalinity in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant differences are denoted with different superscripts.

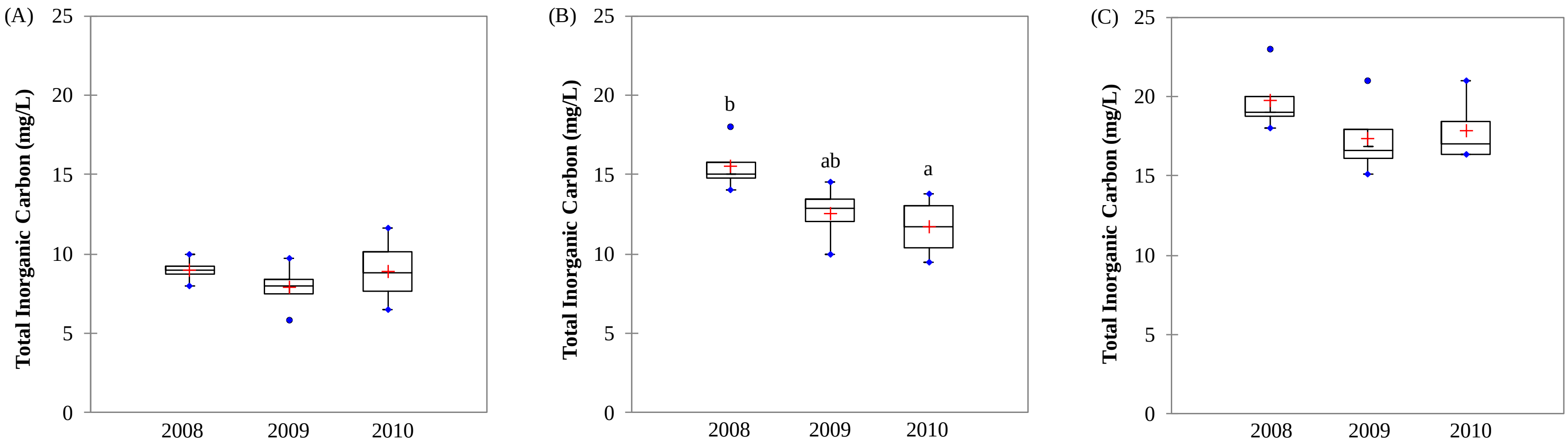


Figure 5.3.4-70. Total inorganic carbon in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant differences are denoted with different superscripts.

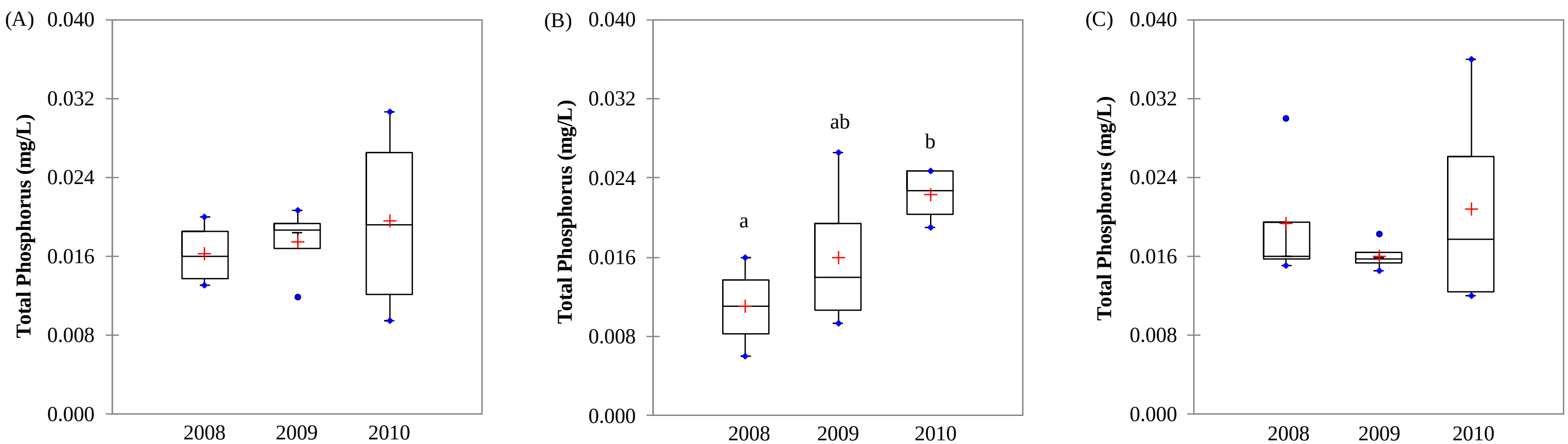


Figure 5.3.4-71. Total phosphorus in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant differences are denoted with different superscripts.

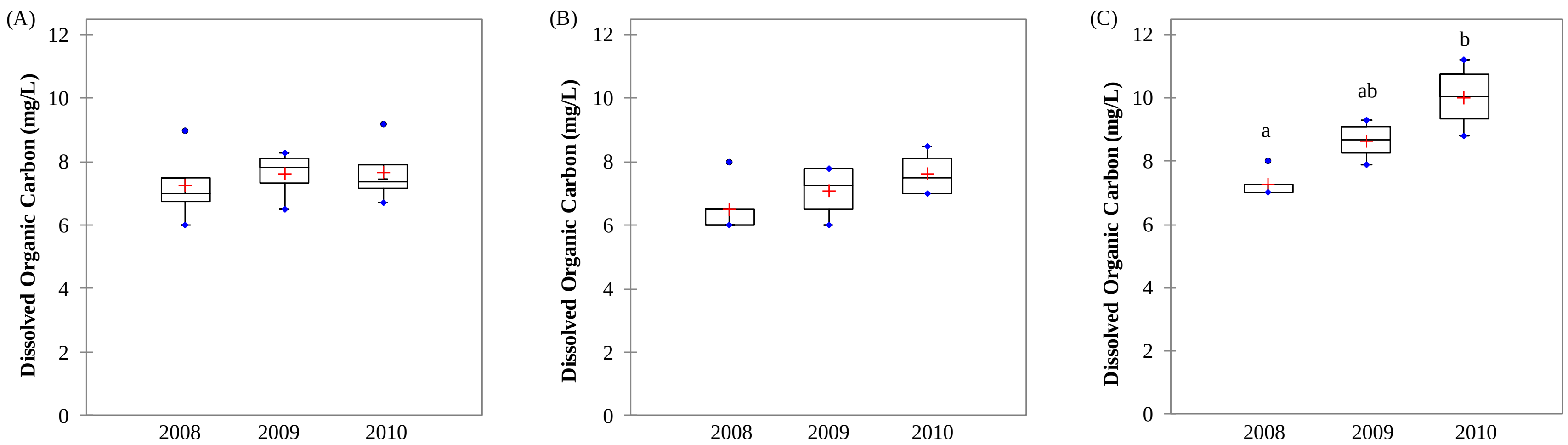
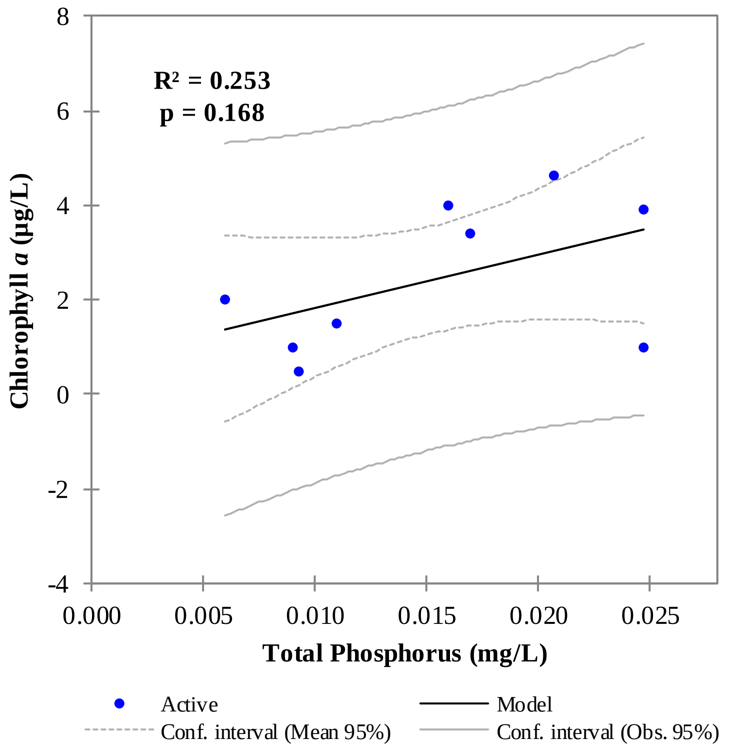


Figure 5.3.4-72. Dissolved organic carbon in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant differences are denoted with different superscripts.

(A)



(B)

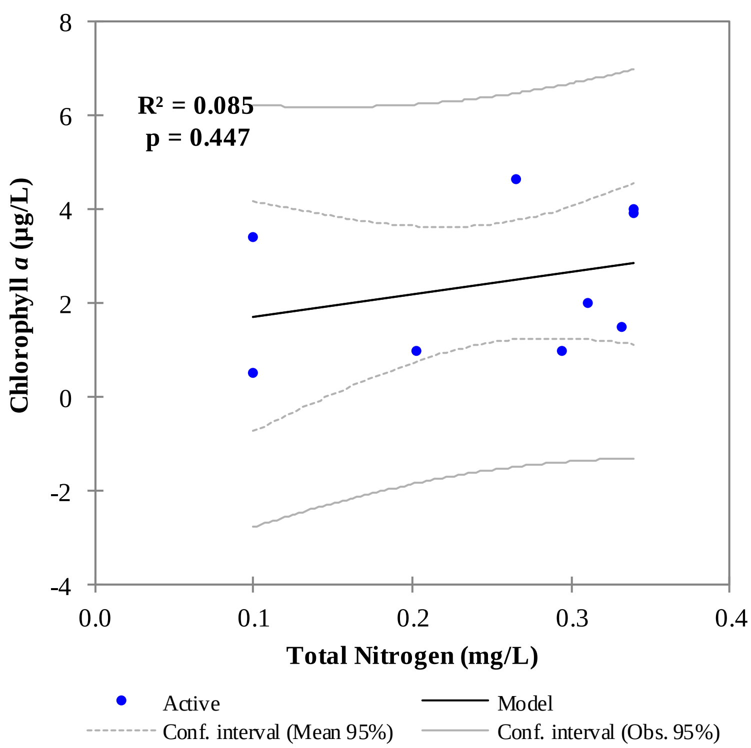
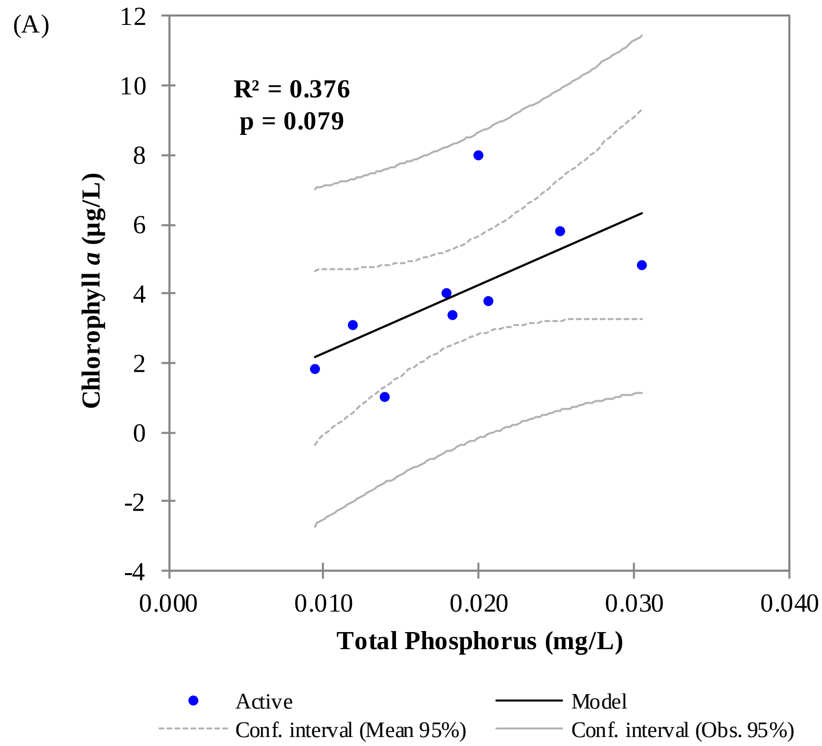


Figure 5.3.4-73. Linear regression between chlorophyll *a* and (A) total phosphorus and (B) total nitrogen in Southern Indian Lake Area 4: open-water seasons 2008-2010.



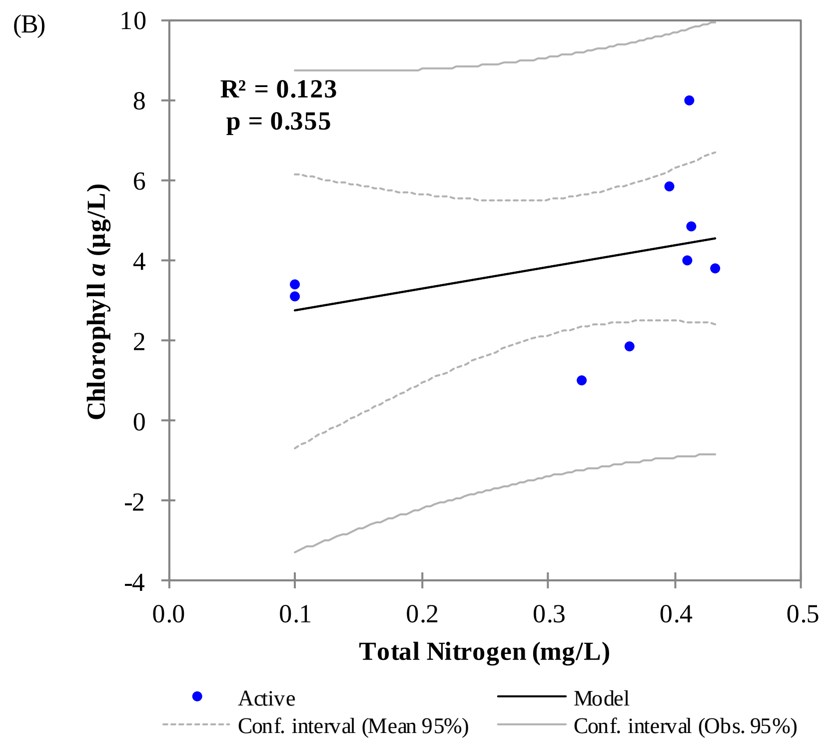


Figure 5.3.4-74. Linear regression between chlorophyll *a* and (A) total phosphorus and (B) total nitrogen in Granville Lake: open-water seasons 2008-2010.

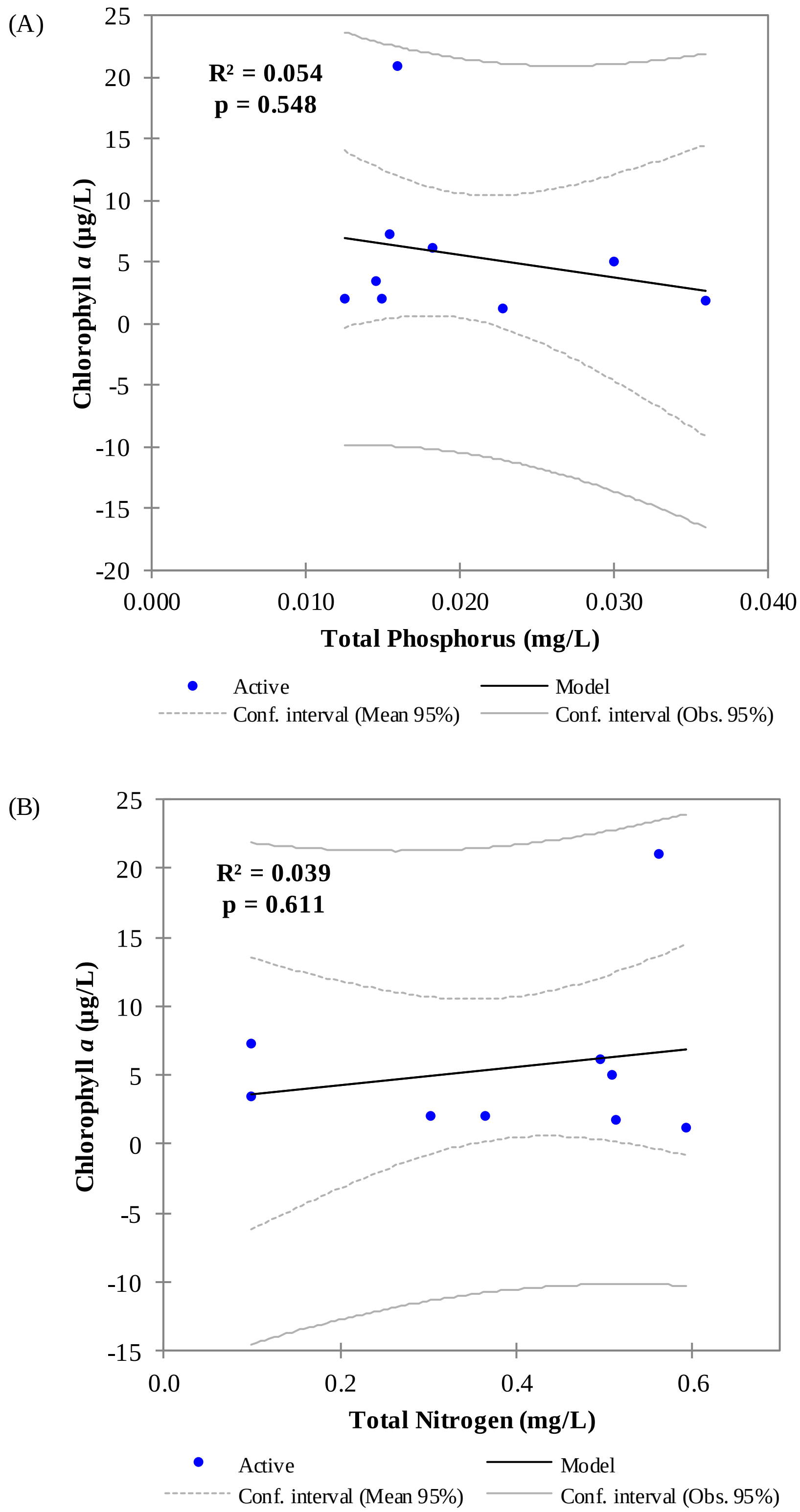


Figure 5.3.4-75. Linear regression between chlorophyll *a* and (A) total phosphorus and (B) total nitrogen in Gauer Lake: open-water seasons 2008-2010.

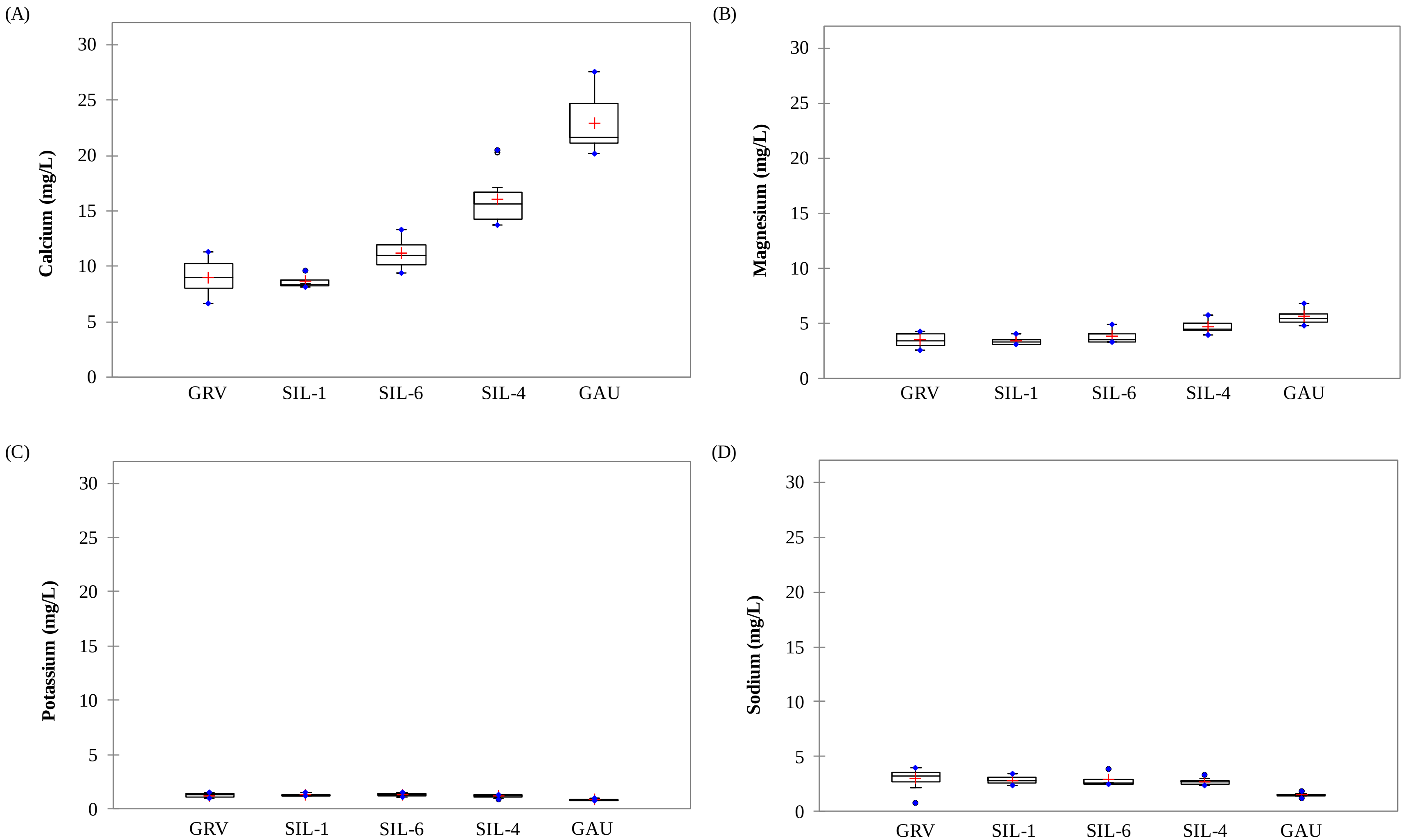


Figure 5.3.4-76. Concentrations of (A) calcium, (B) magnesium, (C) potassium, and (D) sodium measured in the Upper Churchill River Region by waterbody.

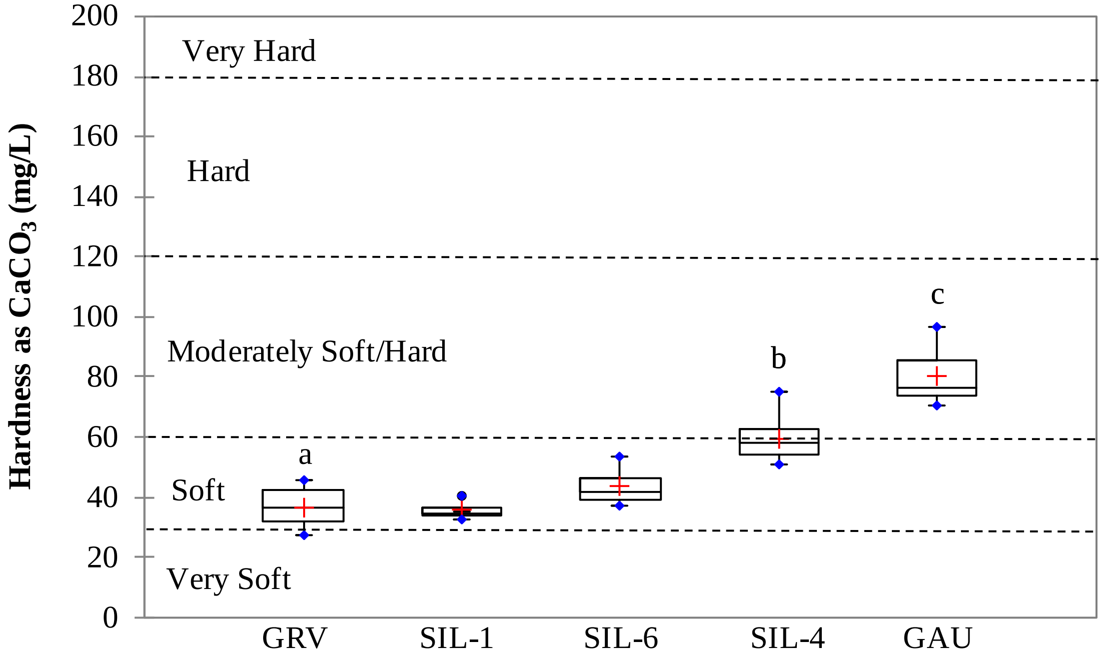
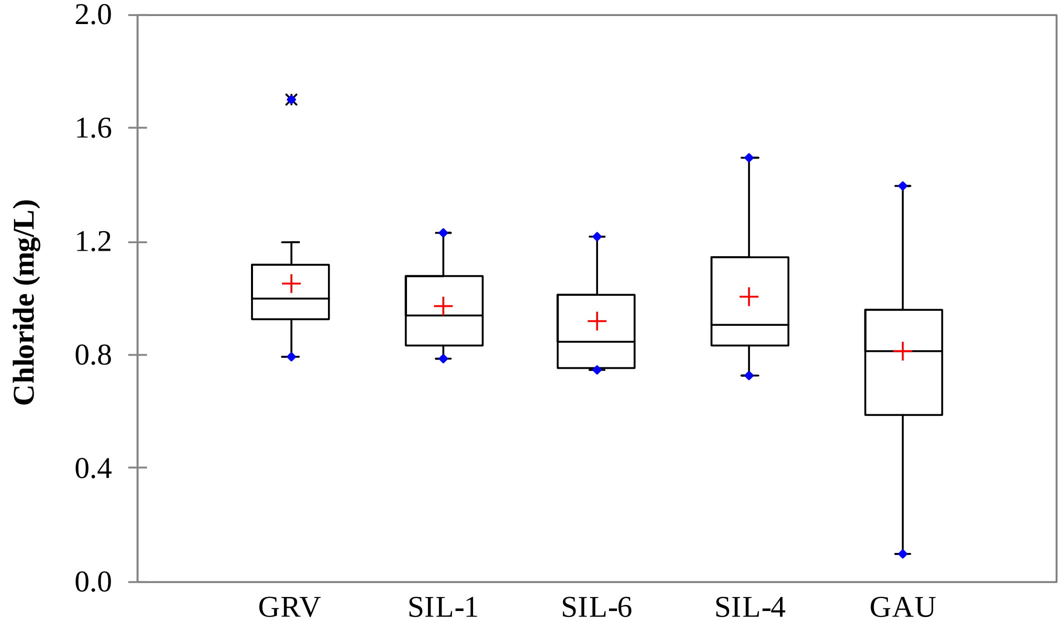


Figure 5.3.4-77. Water hardness measured in the Upper Churchill River Region by waterbody.

(A)



(B)

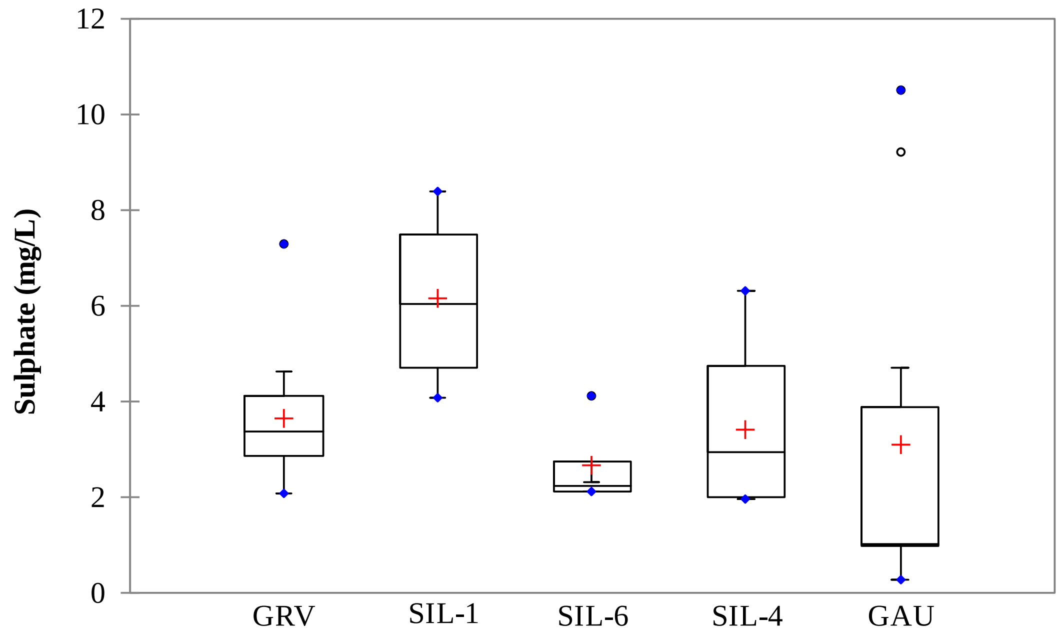


Figure 5.3.4-78. Concentrations of (A) chloride and (B) sulphate measured in the Upper Churchill River Region by waterbody.

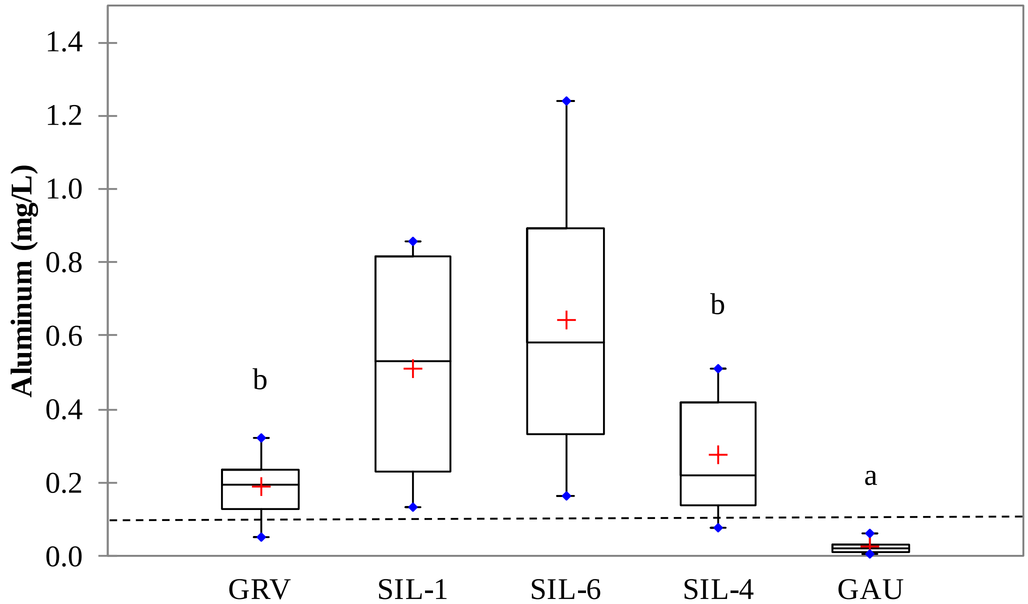


Figure 5.3.4-79. Aluminum in the Upper Churchill River Region: 2008-2010. The dashed line represents the Manitoba PAL guideline.

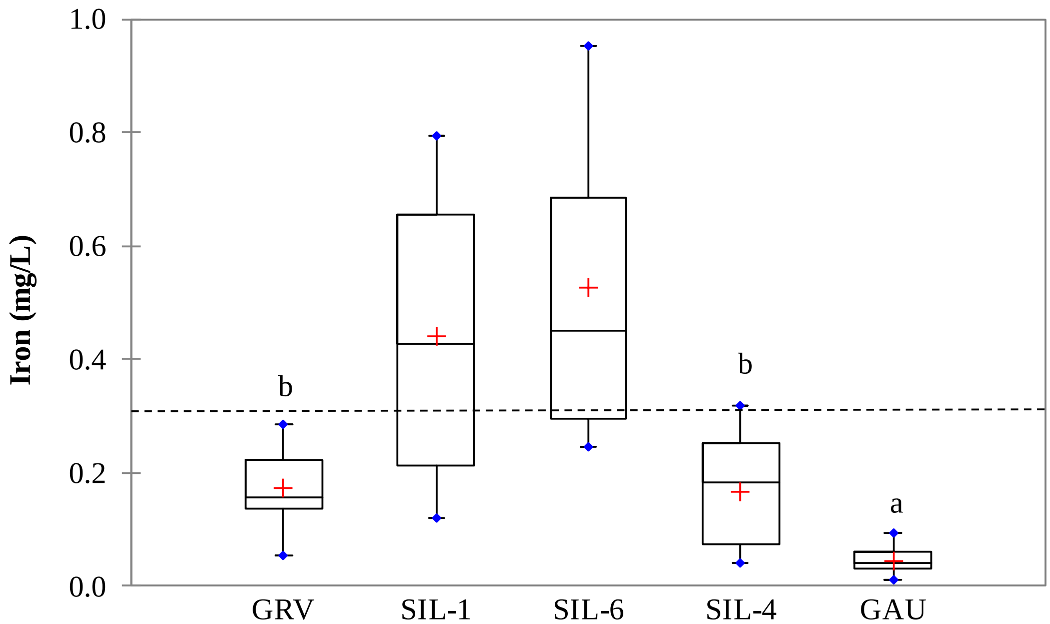


Figure 5.3.4-80. Iron in the Upper Churchill River Region: 2008-2010. The dashed line represents the Manitoba PAL guideline. Statistically significant spatial differences are denoted with different superscripts.

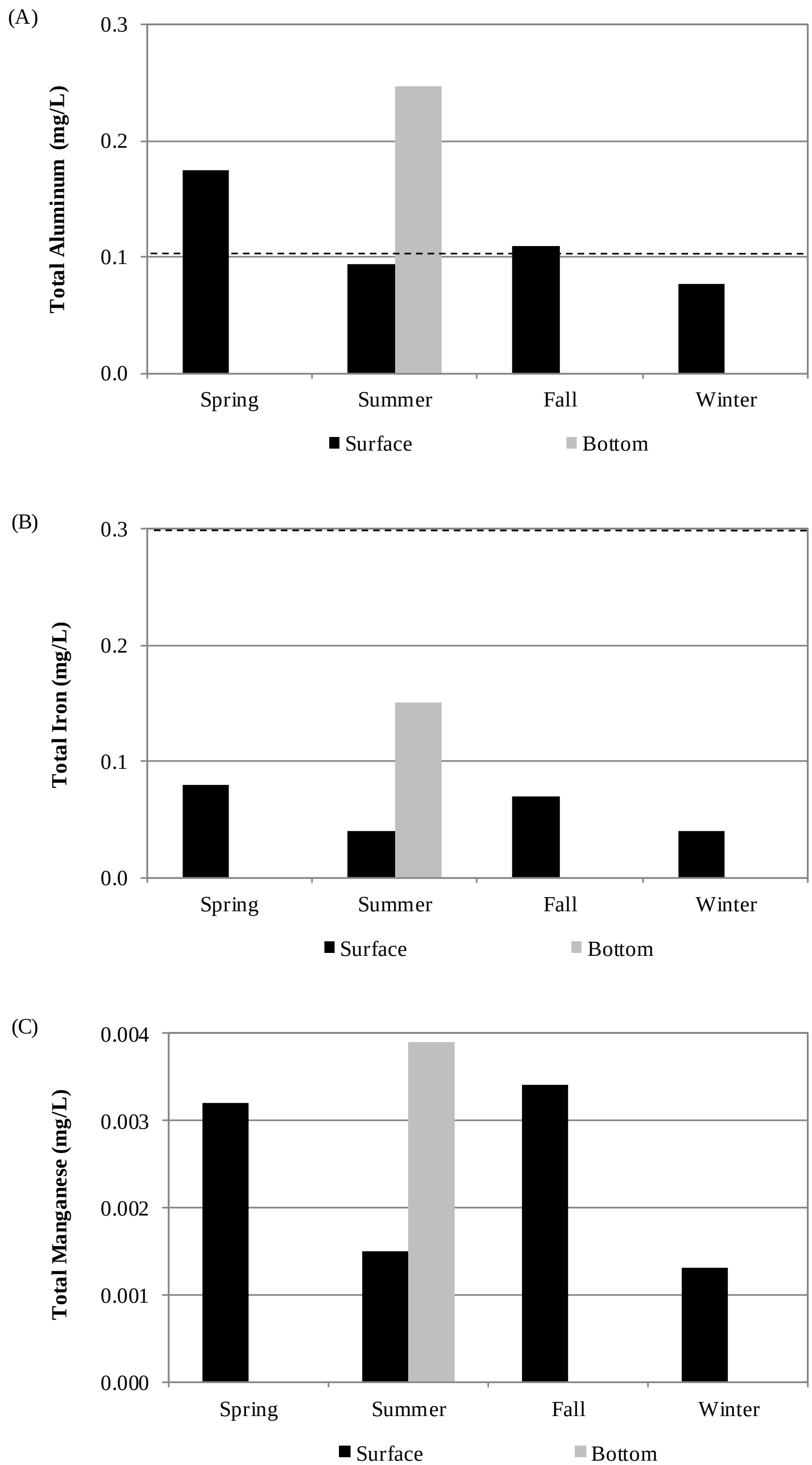


Figure 5.3.4-81. Total aluminum (A), iron (B), and manganese (C) measured in surface grabs and bottom samples in Southern Indian Lake-Area 4, 2008/2009. The black dashed lines indicate the MWQSOG for PAL for aluminum and iron.

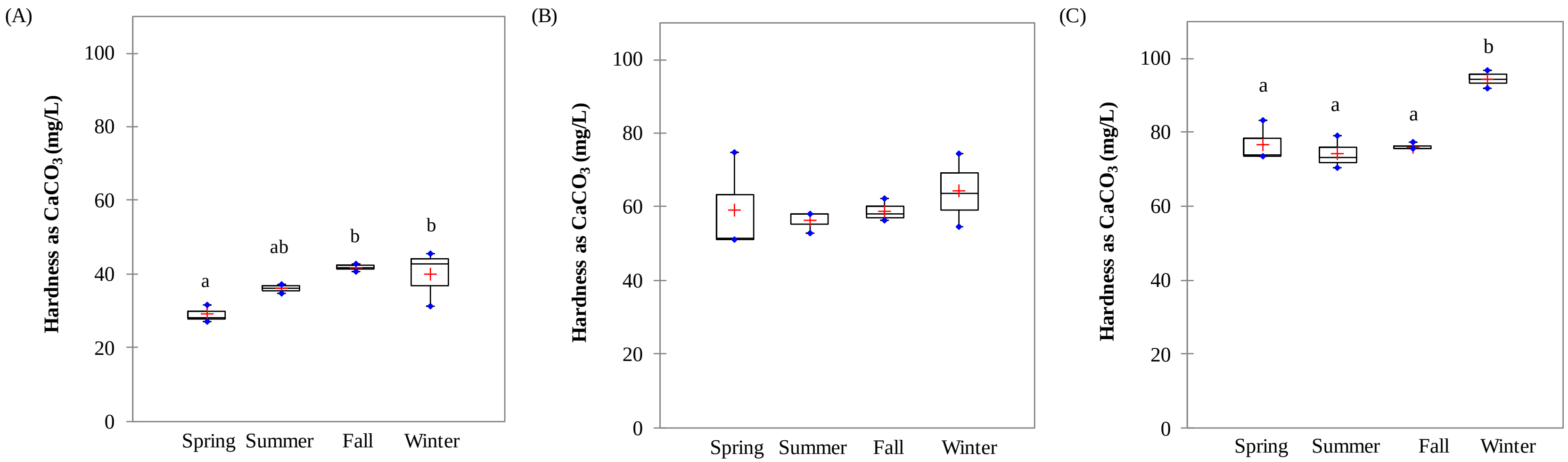


Figure 5.3.4-82. Hardness in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

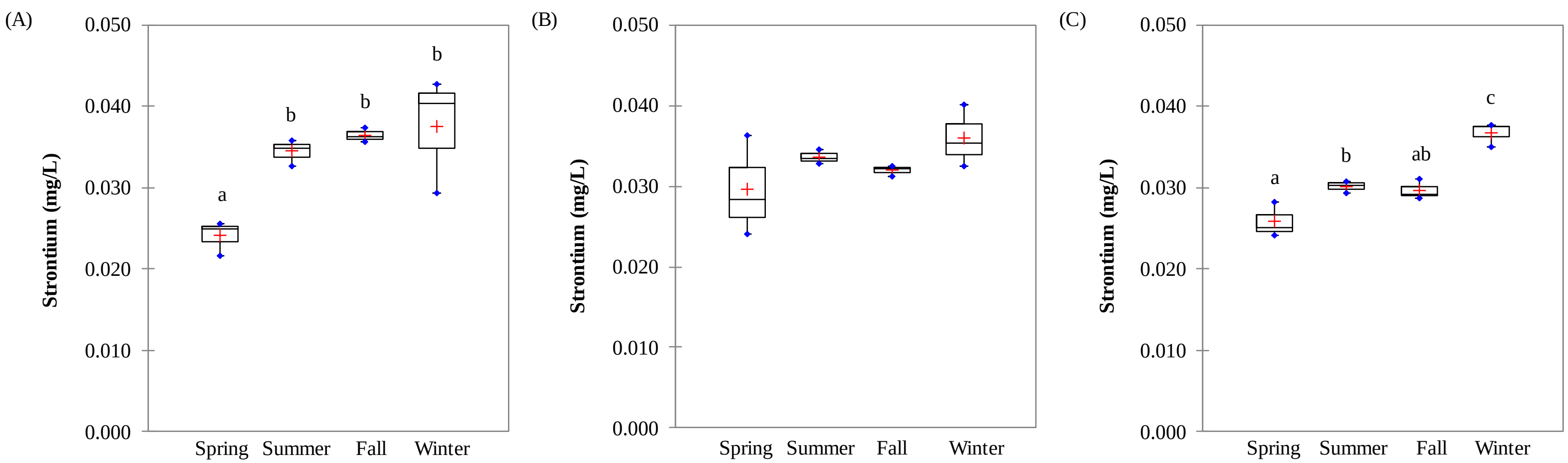


Figure 5.3.4-83. Strontium in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

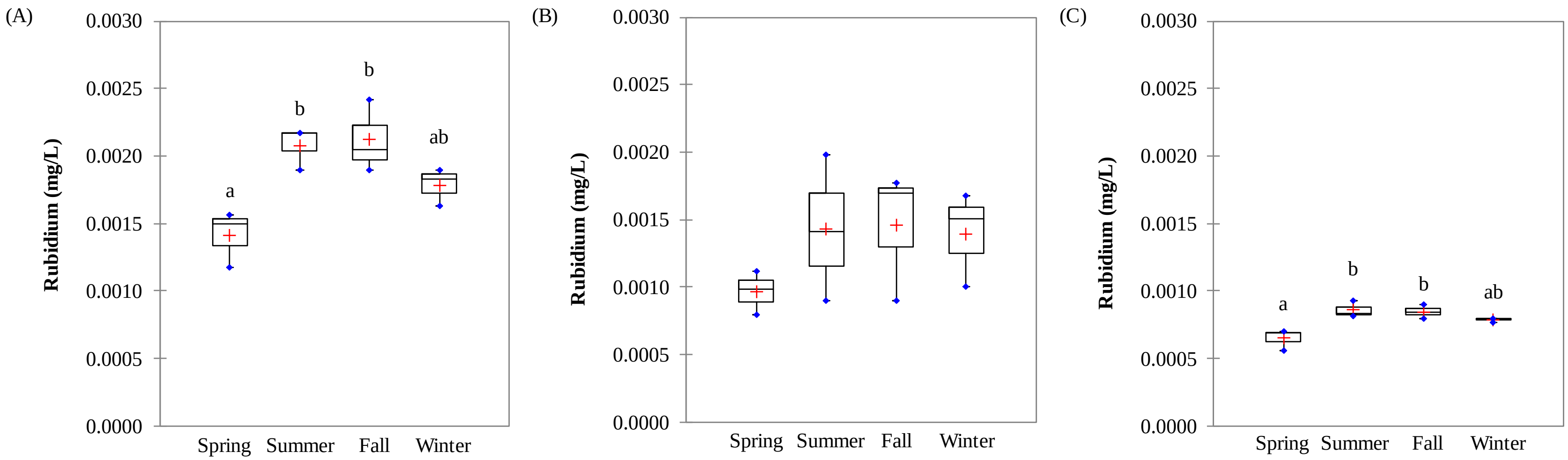


Figure 5.3.4-84. Rubidium in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

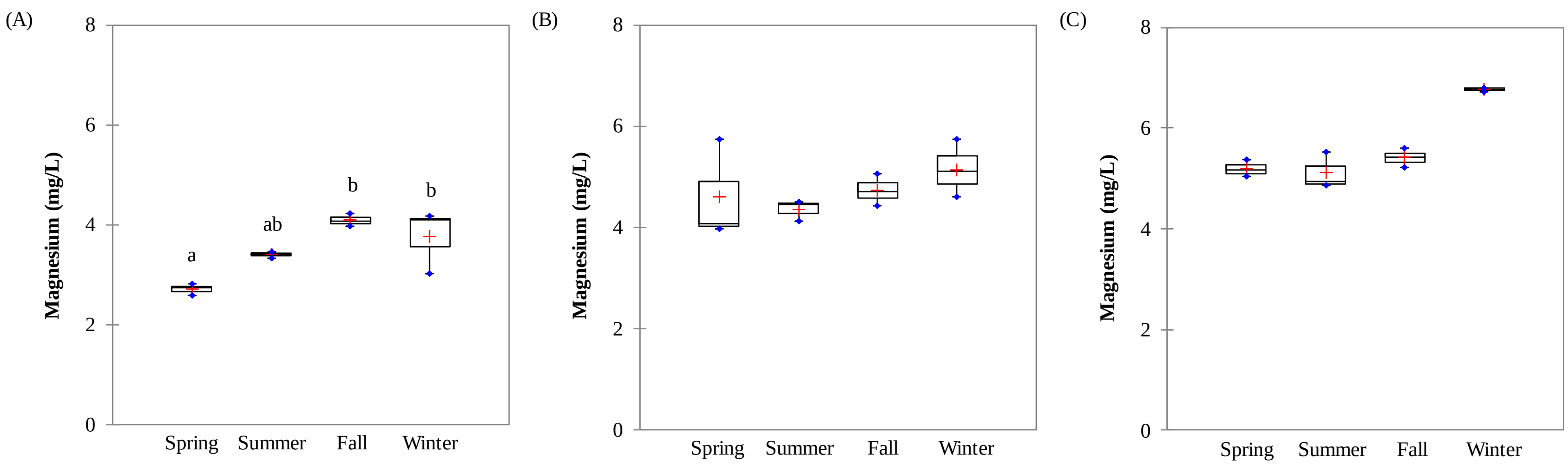


Figure 5.3.4-85. Magnesium in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

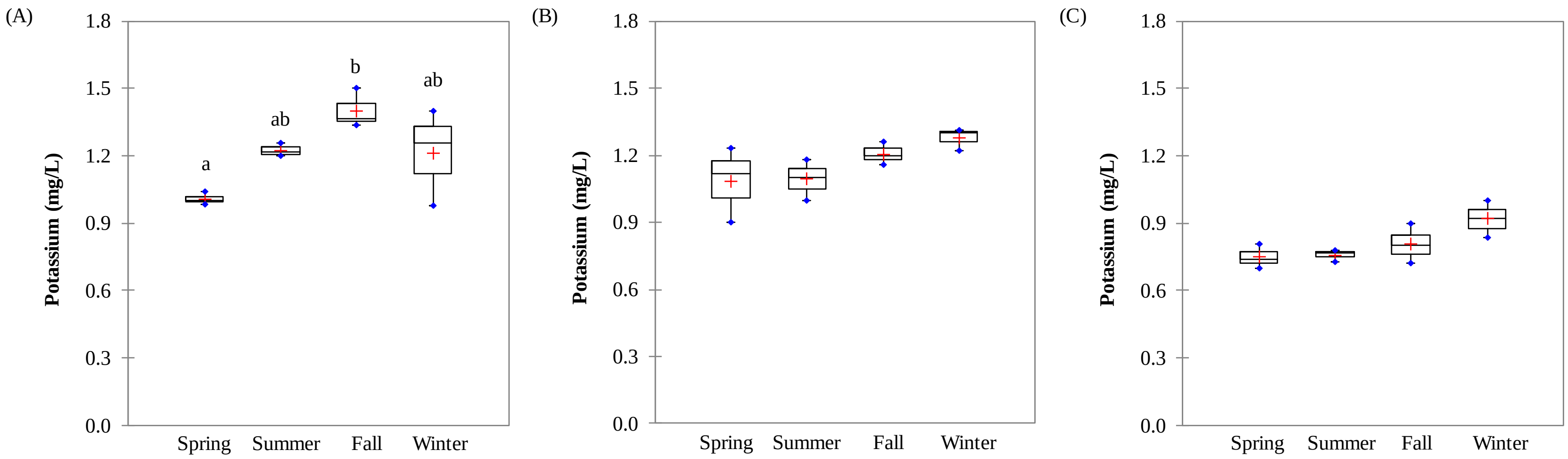


Figure 5.3.4-86. Potassium in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

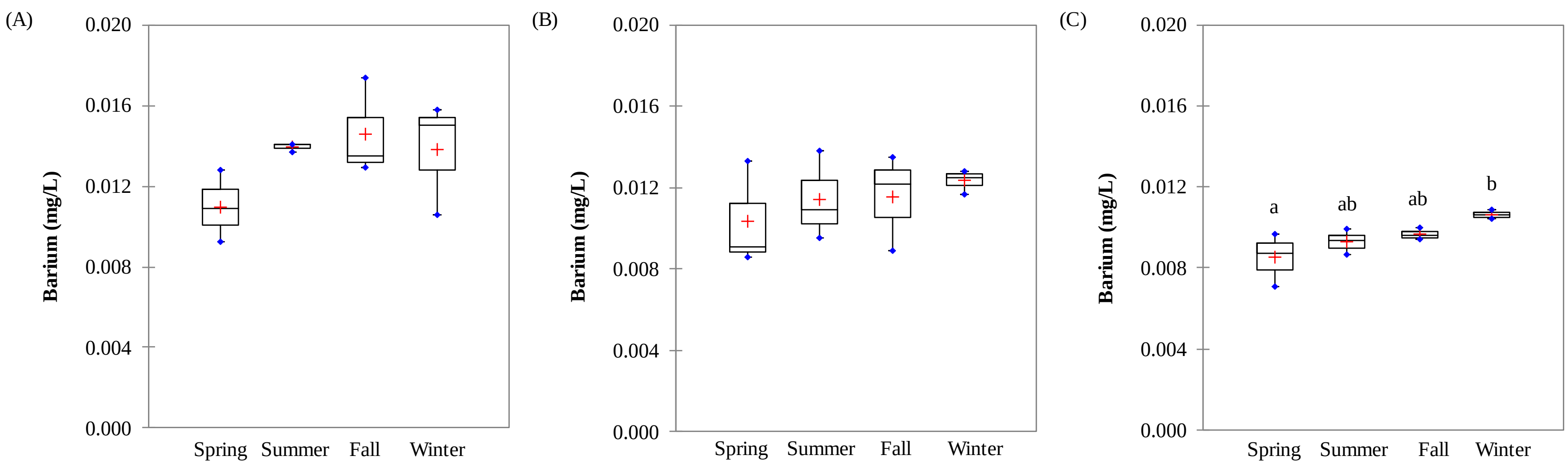


Figure 5.3.4-87. Barium in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

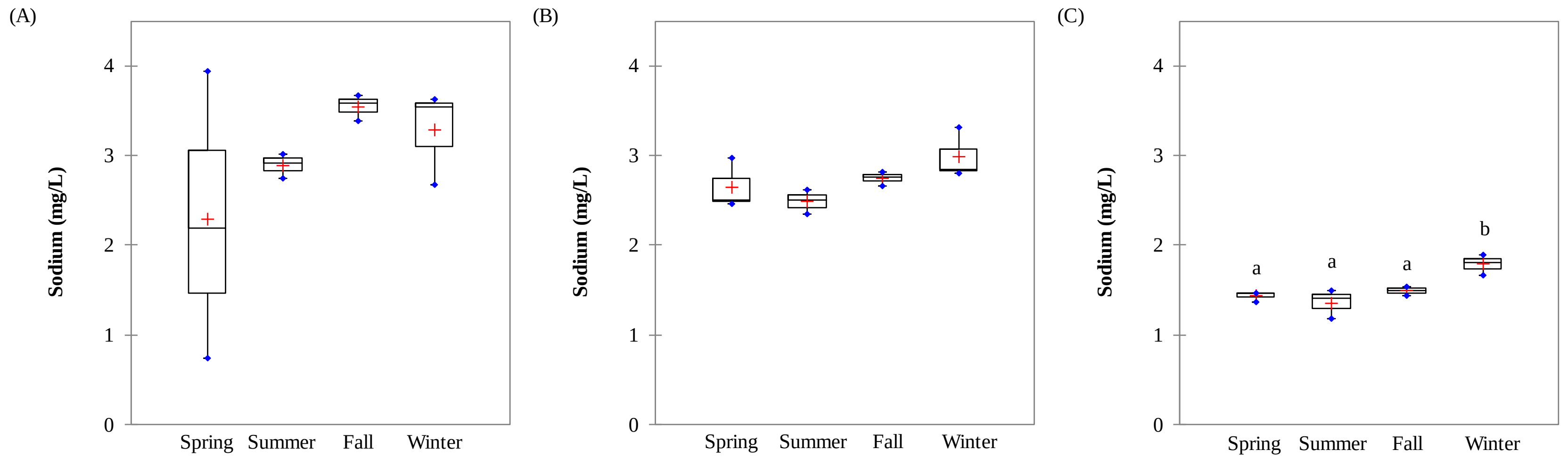


Figure 5.3.4-88. Sodium in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

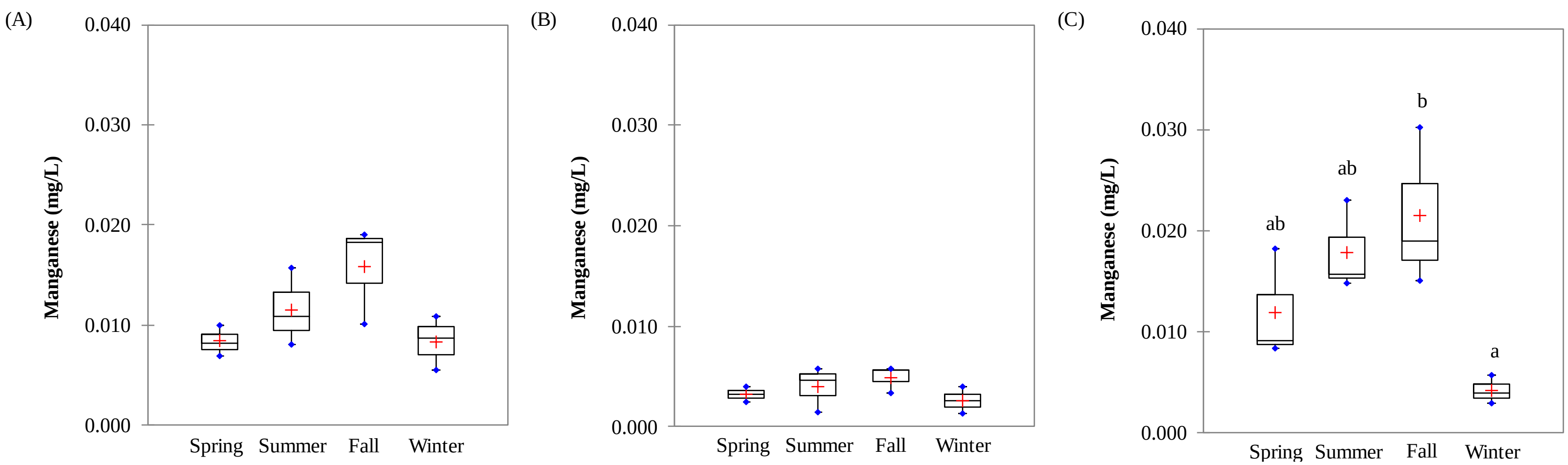


Figure 5.3.4-89. Manganese in the Upper Churchill River Region by season: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant seasonal differences are denoted with different superscripts.

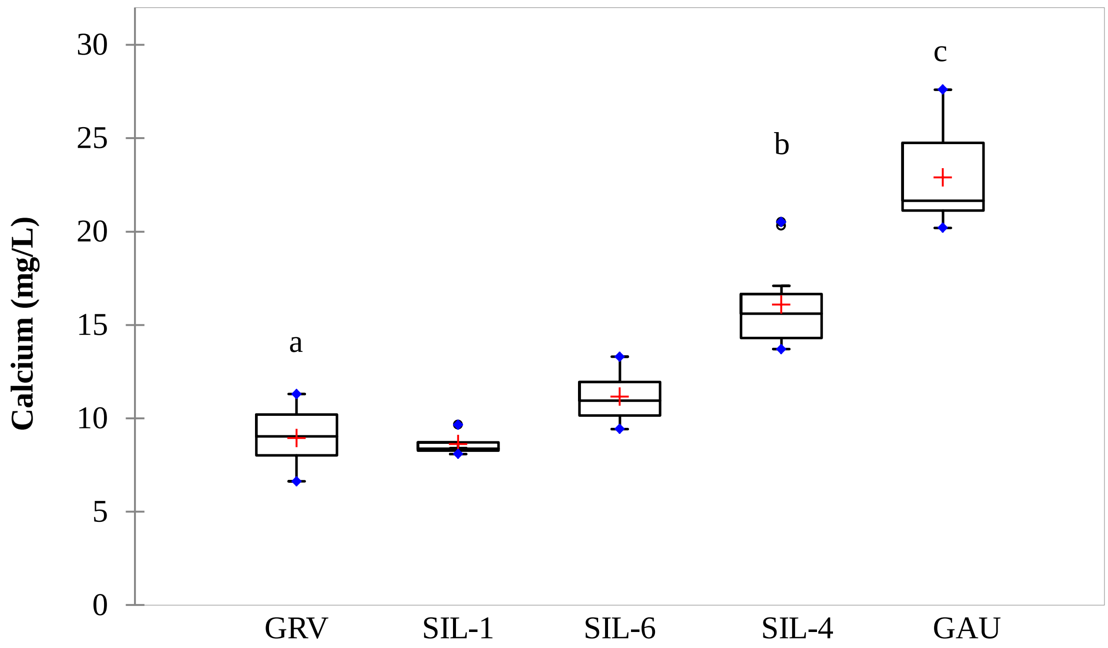


Figure 5.3.4-90. Calcium in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

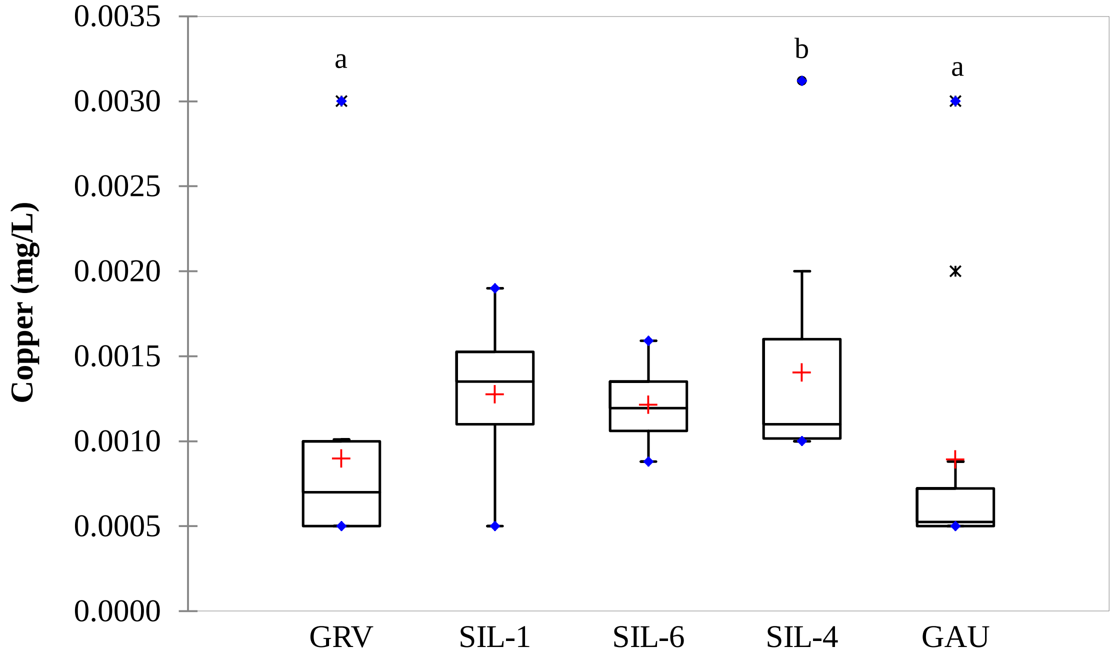


Figure 5.3.4-91. Copper in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

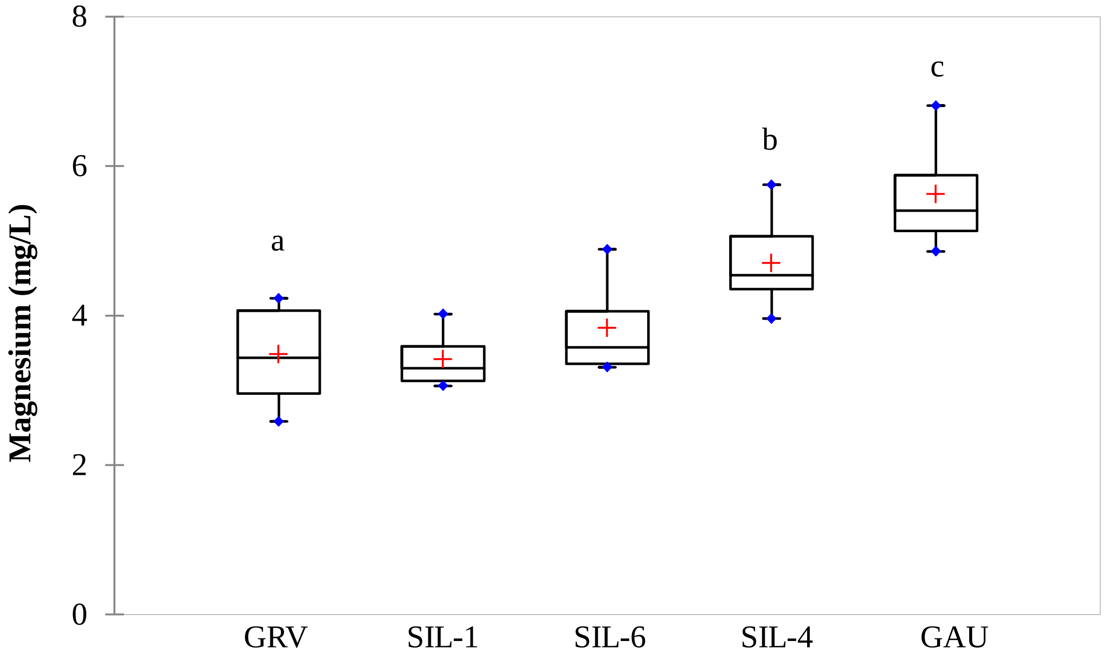


Figure 5.3.4-92. Magnesium in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

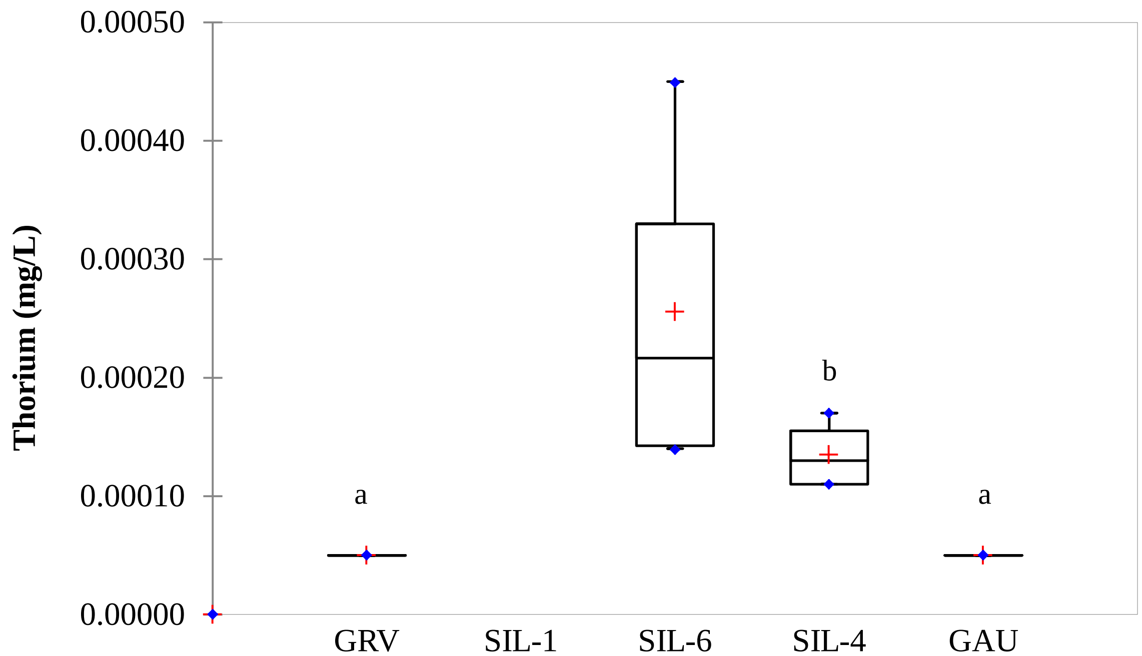


Figure 5.3.4-93. Thorium in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

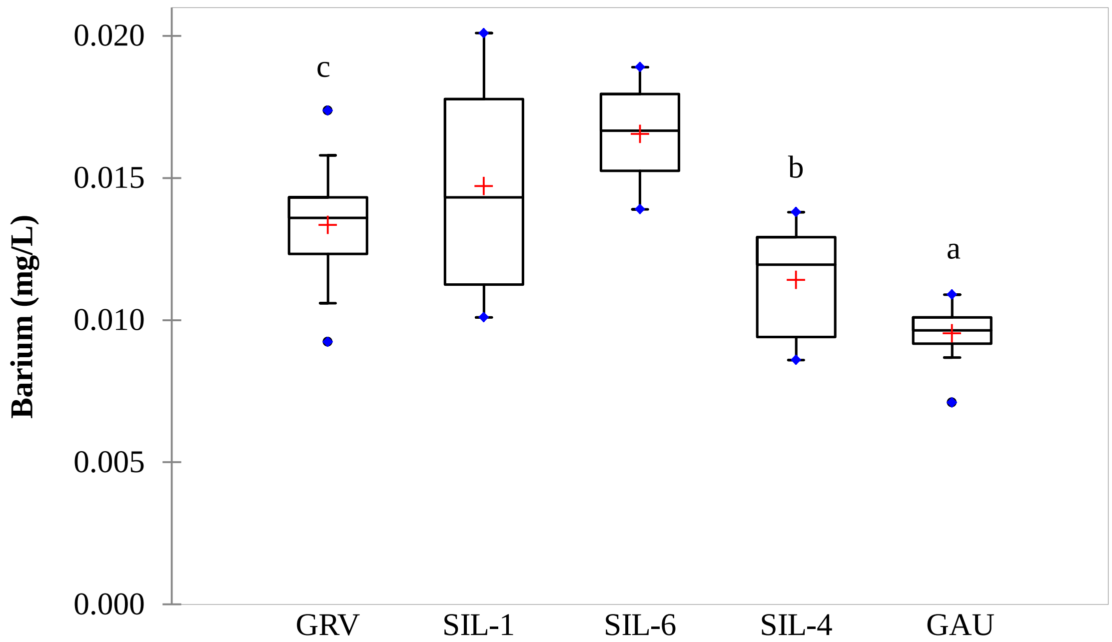


Figure 5.3.4-94. Barium in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

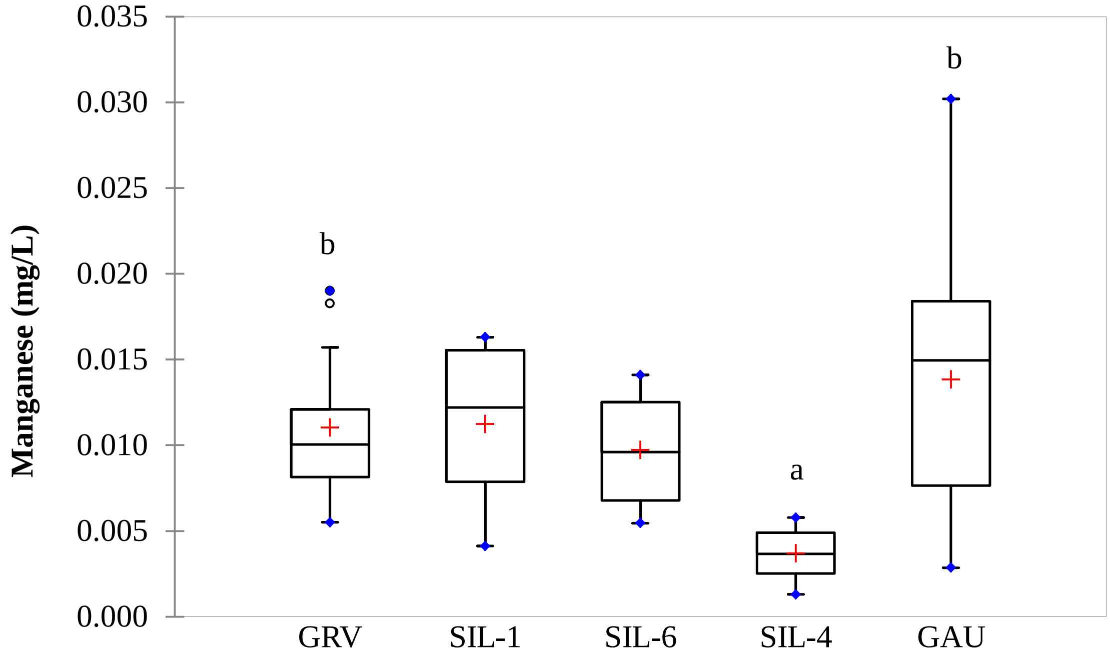


Figure 5.3.4-95. Manganese in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

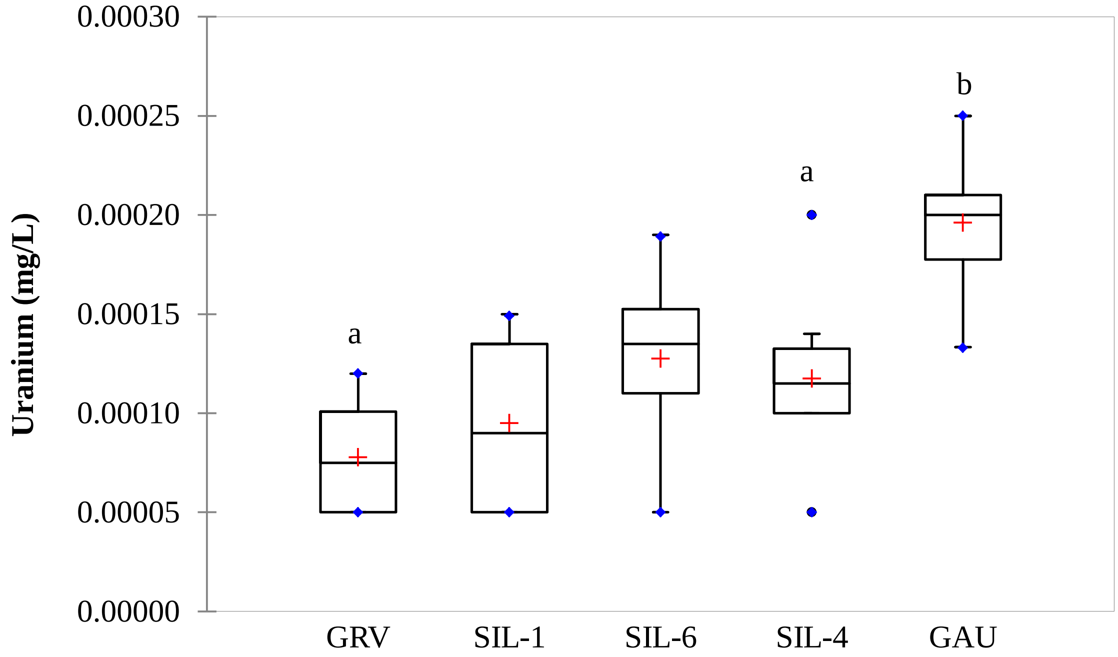


Figure 5.3.4-96. Uranium in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

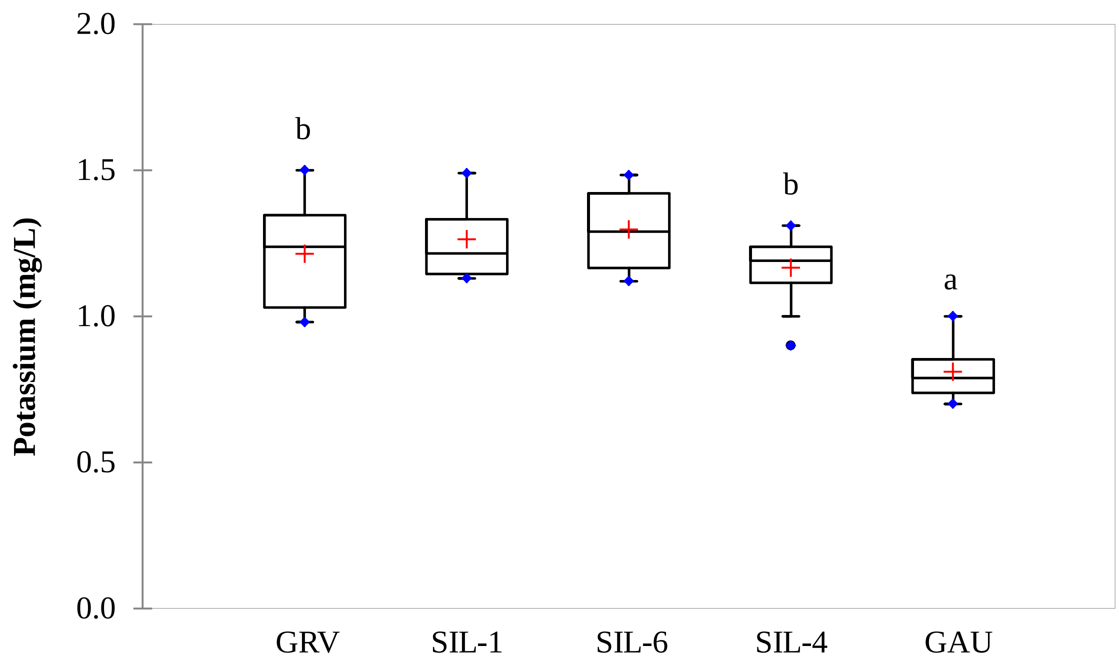


Figure 5.3.4-97. Potassium in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

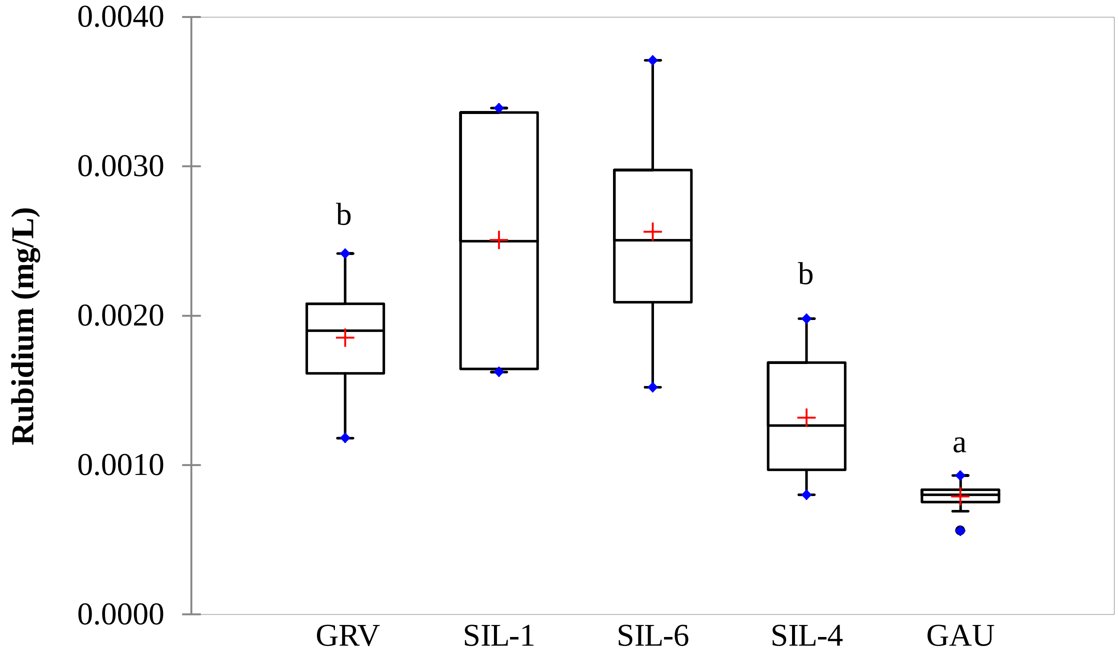


Figure 5.3.4-98. Rubidium in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

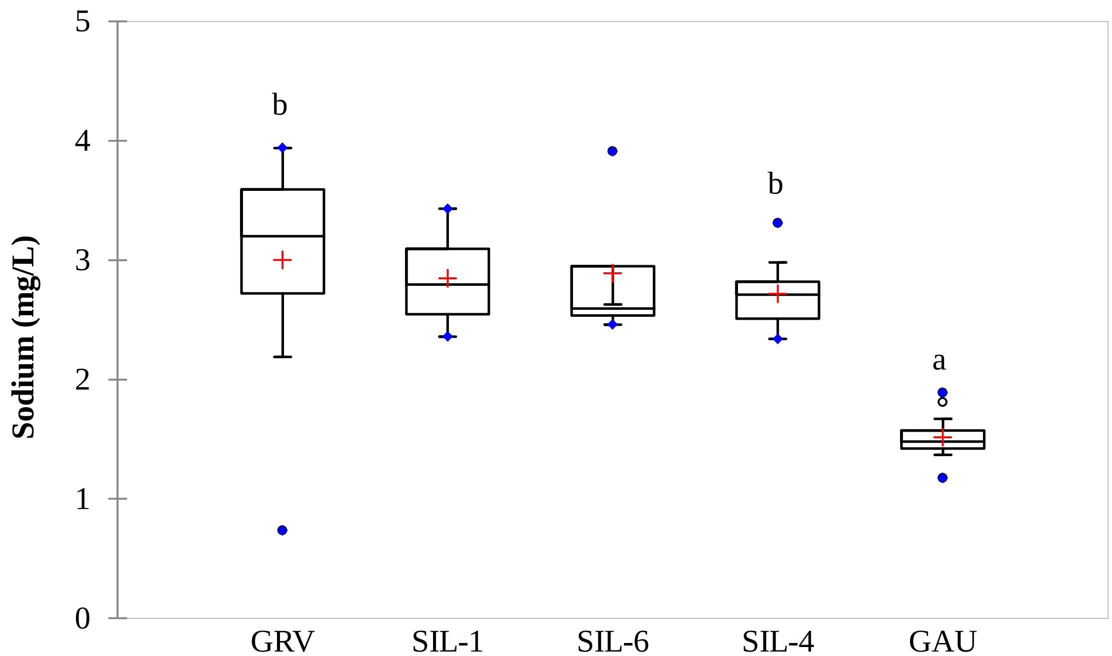


Figure 5.3.4-99. Sodium in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

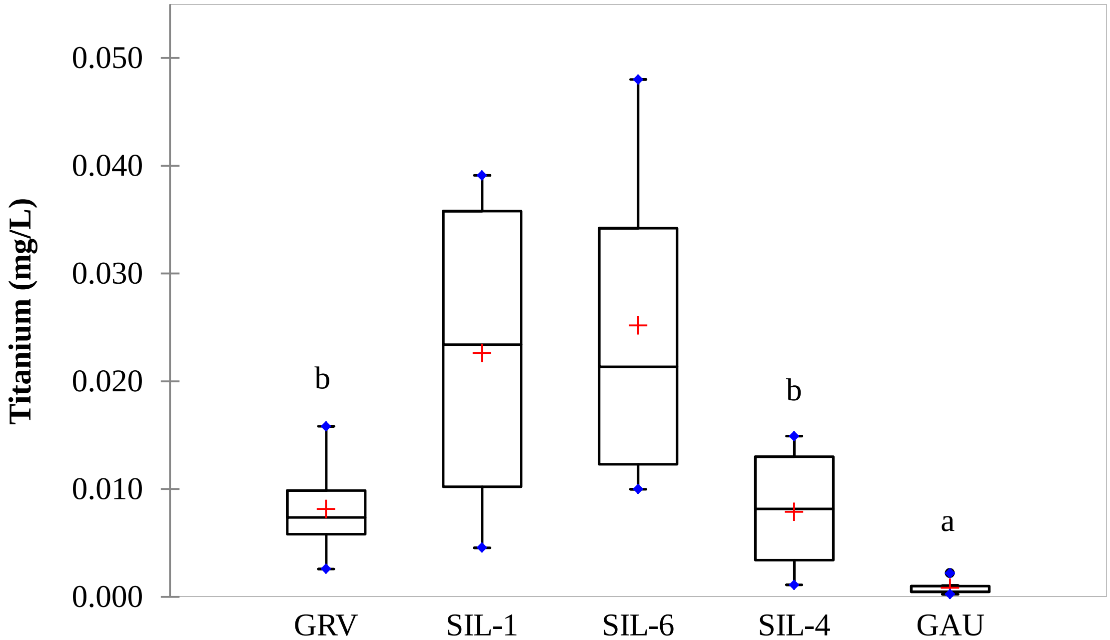


Figure 5.3.4-100. Titanium in the Upper Churchill River Region: 2008-2010. Statistically significant spatial differences are denoted with different superscripts.

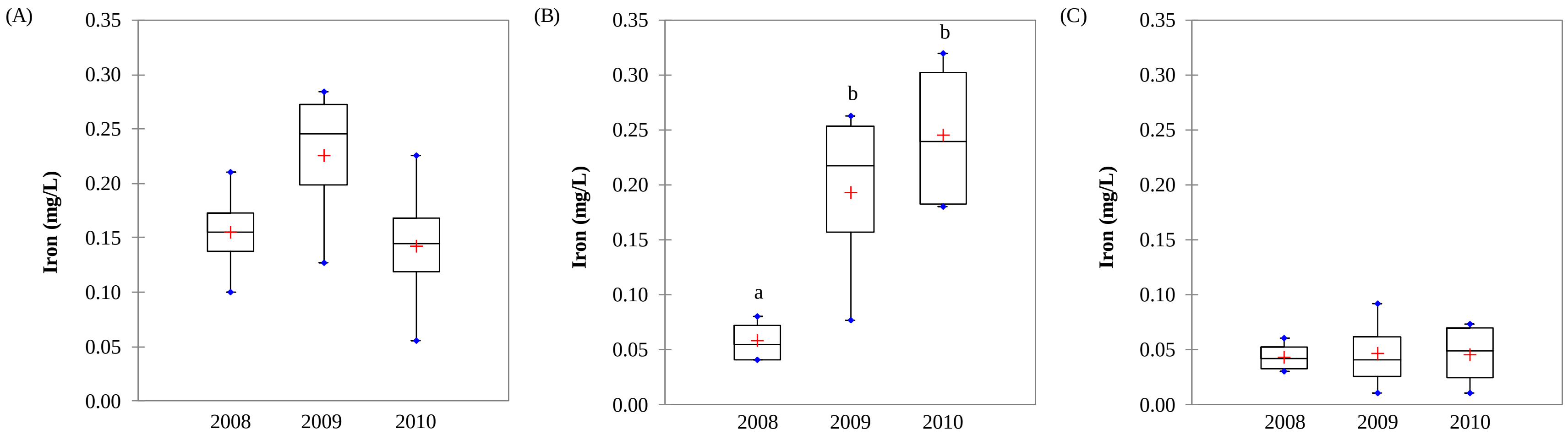


Figure 5.3.4-101. Iron in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant spatial differences are denoted with different superscripts.

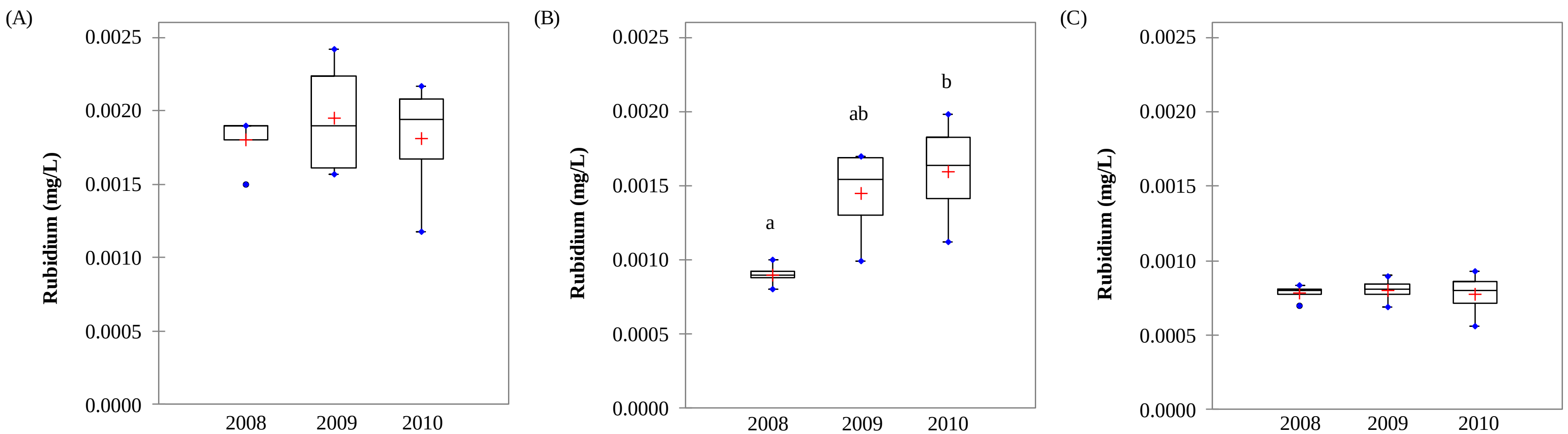


Figure 5.3.4-102. Rubidium in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant spatial differences are denoted with different superscripts.

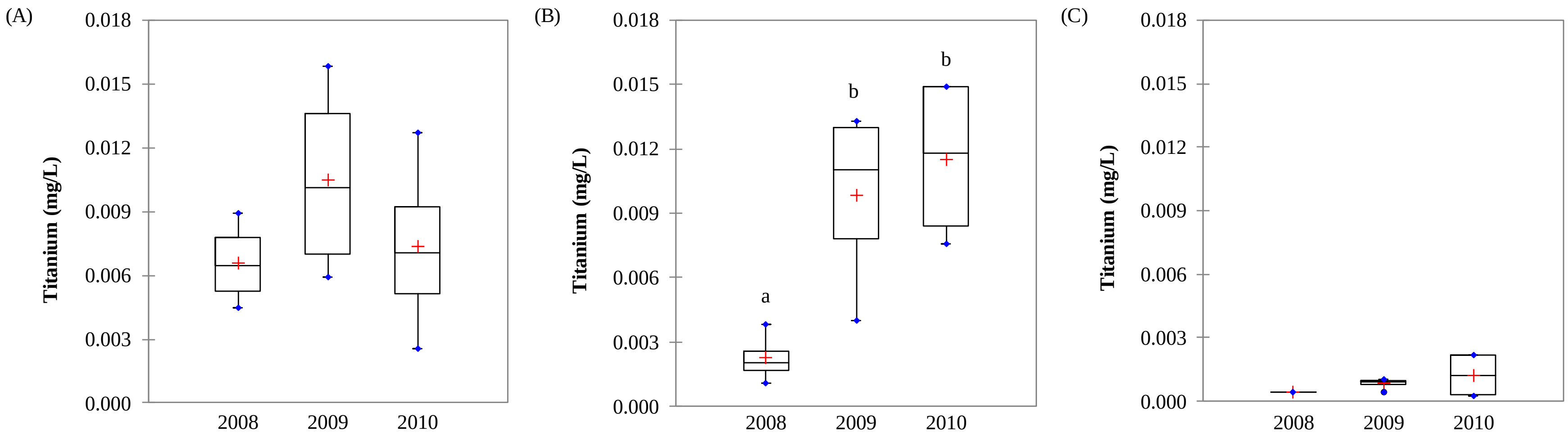


Figure 5.3.4-103. Titanium in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant spatial differences are denoted with different superscripts.

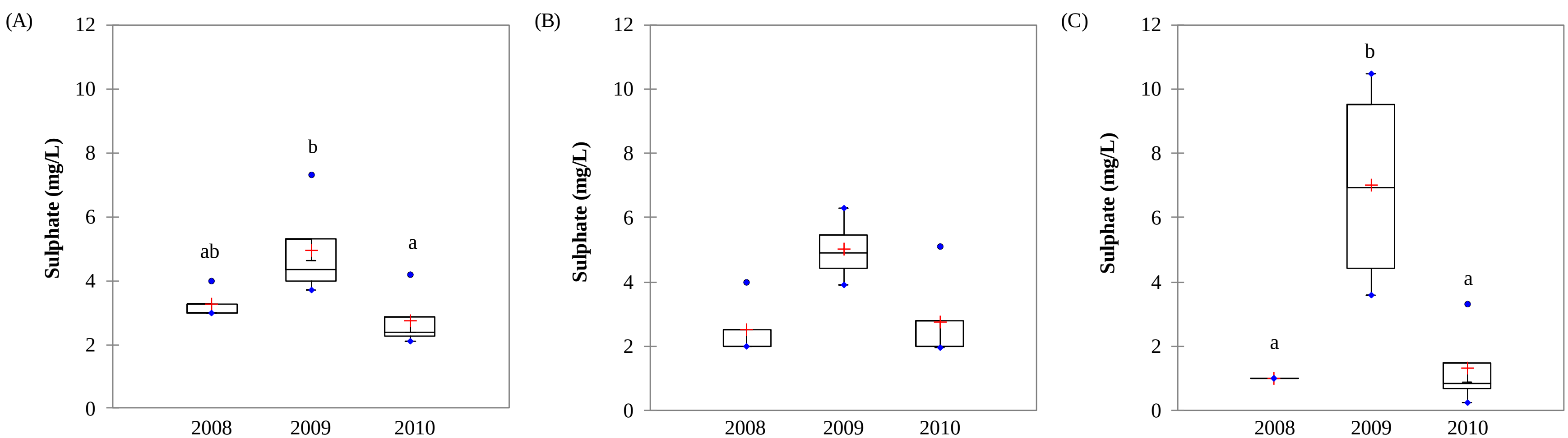


Figure 5.3.4-104. Sulphate in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant spatial differences are denoted with different superscripts.

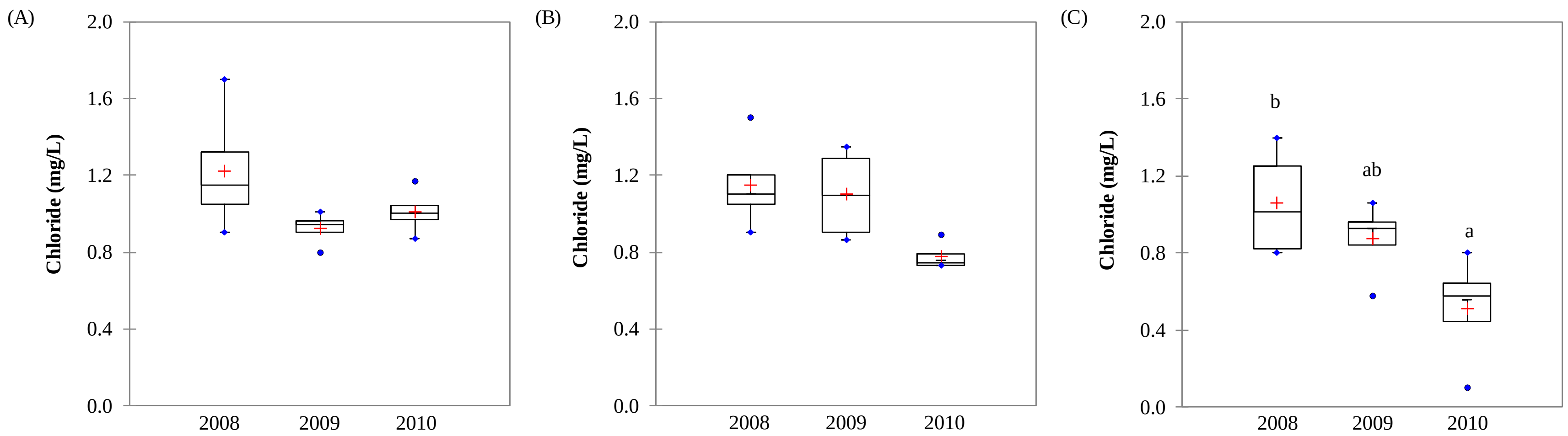


Figure 5.3.4-105. Chloride in the Upper Churchill River Region: 2008-2010: (A) Granville Lake; (B) Southern Indian Lake-Area 4; and (C) Gauer Lake. Statistically significant spatial differences are denoted with different superscripts.

5.3.5 Phytoplankton

The following provides an overview of phytoplankton monitoring results for the Upper Churchill River Region over the three years of CAMPP. Sampling sites and periods were consistent with the water quality monitoring program and included annual monitoring at Southern Indian Lake-Area 4 (SIL-Area 4) and Granville Lake (an off-system lake) at a site located approximately 200 km upstream of the Missi Falls Control Structure (CS; Figure 5.3.4-1). Water quality and phytoplankton were also monitored at two rotational sites: Southern Indian Lake-Area 1 (SIL-Area 1) and Southern Indian Lake-Area 6 (SIL-Area 6). Although Gauer Lake (an annual off-system lake) is formerly part of the Lower Churchill River Region, results from this site are included below for comparison. Sampling times relative to air temperature are presented in Figure 5.3.4-2.

Chlorophyll *a* was measured at all sites and sampling times in conjunction with the water quality sampling program. Data are therefore sufficient for statistical analysis and seasonal, temporal, and spatial variability was assessed for this parameter.

Phytoplankton biomass and taxonomic composition were measured in Granville Lake, SIL-Area 1, SIL-Area 4, and Gauer Lake in 2009/2010, and in SIL-Area 6 in 2010/2011. Due to limited data, phytoplankton biomass, composition and community metrics were not assessed statistically; analyses will be conducted in the future when additional data are available.

Chlorophyll *a* was above the bloom monitoring trigger of 10 µg/L in the sample collected from Gauer Lake in summer 2008; this sample was analysed for phytoplankton biomass and taxonomic composition and microcystin-LR (an algal toxin).

5.3.5.1 Chlorophyll a

Over the three years of CAMPP, chlorophyll *a* concentrations in the Upper Churchill River Region were low to moderate. The maximum concentration measured during the ice-cover season was 4 µg/L, whereas chlorophyll *a* concentrations measured during the open-water season ranged up to 21.0 µg/L (Figure 5.3.5-1). Concentrations at the on-system sites were generally similar to those measured in the off-system waterbodies (Granville and Gauer lakes), although chlorophyll *a* in Gauer Lake tended to be somewhat higher during summer.

5.3.5.2 Taxonomic Composition and Biomass

Phytoplankton biomass measured during the open-water season varied between the four sampling sites in the Upper Churchill River Region, as well as to Gauer Lake (Figure 5.3.5-2).

The most notable difference was the higher biomass measured at Gauer Lake relative to those sites located along the upper Churchill River (i.e., Granville Lake and SIL-Areas 1, 6, and 4). In addition, phytoplankton biomass at SIL-Area 1 and Granville Lake was also slightly higher than at SIL-Area 6 or SIL-Area 4; however, as SIL-Area 6 was sampled in 2010 and the other waterbodies were sampled in 2009, these differences may reflect temporal and not spatial differences.

With one exception, total phytoplankton biomass varied seasonally in each waterbody (Figure 5.3.5-2). The exception was SIL-Area 4, where total biomass was relatively stable throughout the open-water season.

Phytoplankton community composition also varied between the waterbodies in the region, as well as Gauer Lake. Diatoms or cryptophytes were the dominant algal group at most sites in most seasons (Figure 5.3.5-3). Specifically, diatoms dominated the community at Granville Lake during all seasons, at SIL-Area 1 in spring and fall, at SIL-Area 4 in spring and summer, and at Gauer Lake in summer and fall. Cryptophytes dominated the phytoplankton community at SIL-Area 6 during all seasons and this group was also dominant at SIL-Area 1 in summer, SIL-Area 4 in fall, and Gauer Lake in spring. However, as previously noted, SIL-Area 6 was sampled in a different year than the other sites and differences in the phytoplankton community may reflect temporal and not spatial differences.

Metrics describing the phytoplankton community were calculated on a seasonal basis and are presented in Table 5.3.5-1. Overall, community complexity tended to be higher in the off-system lakes (Granville and Gauer lakes) than in Southern Indian Lake (Table 5.3.5-1).

5.3.5.3 Bloom Monitoring

Chlorophyll *a* exceeded the bloom monitoring trigger of 10 µg/L at Gauer Lake during summer 2008. Total biomass measured in the sample was moderate (8,310 mg/m^3) and the community was dominated by blue-green algae (Figure 5.3.5-4).

5.3.5.4 Microcystin

Some forms of blue-green algae are capable of producing microcystins (liver toxins), including species of *Anabaena*, *Aphanizomenon*, *Microcystis*¸ *Nostoc* and *Planktothrix* (a.k.a. *Oscillatoria*; Zurawell et al. 2005). Although not completely understood, several factors such as species, bacterial strain, and environmental conditions appear to affect production of microcystins. *Anabaena*, *Aphanizomenon*, and *Planktothrix*/*Oscillatoria* were identified in samples collected from every waterbody in the region.

During the Pilot Program, microcystin-LR was analysed once when chlorophyll *a* results exceeded 10 µg/L (i.e., the threshold for microcystin-LR analysis). Microcystin-LR was not detected (<0.2 µg/L) in summer 2008 in Gauer Lake.

5.3.5.5 Trophic Status

Based on mean open-water concentrations of chlorophyll *a*, SIL-Area 6 and SIL-Area 4 are classified as oligotrophic and SIL-Area 1, and Granville and Gauer lakes are categorized as mesotrophic (Table 5.3.4-3).

5.3.5.6 Seasonal Variability

Chlorophyll *a* concentrations measured during the ice-cover season were generally low, regardless of the sampling location; however, concentrations measured at the annual sampling sites (Granville, SIL-Area 4, and Gauer Lakes) were not significantly different between seasons (Figure 5.3.5-1).

5.3.5.7 Spatial Comparisons

Mean annual chlorophyll *a* concentrations were not significantly different between the three annual waterbodies (Granville Lake, SIL-Area 4, and Gauer Lake), nor did concentrations appear to qualitatively differ between the five waterbodies in the Upper Churchill River Region (Figure 5.3.5-5).

5.3.5.8 Temporal Variability

Statistical comparisons between sampling years for the annual waterbodies revealed that there were no significant interannual differences in chlorophyll *a* concentrations over the monitoring period (Figure 5.3.5-6).

Table 5.3.5-1. Diversity, evenness, heterogeneity, and effective richness of the phytoplankton communities in the five waterbodies in the Upper Churchill River Region.

Waterbody	Season	Species Richness (S)	Simpson's Diversity Index (1-G)	Simpson's Evenness (E_D)	Shannon-Weaver Index (H)	Evenness (E_H)	Hill's Effective Richness (E^H)	Evenness (E^H/S)
Granville Lake	Spring	18	0.82	0.32	2.11	0.73	8.29	0.46
	Summer	18	0.82	0.30	2.01	0.70	7.47	0.41
	Fall	15	0.80	0.33	1.87	0.69	6.49	0.43
Southern Indian Lake-Area 1	Spring	15	0.82	0.37	2.08	0.77	8.01	0.53
	Summer	10	0.21	0.13	0.48	0.21	1.61	0.16
	Fall	15	0.43	0.12	1.05	0.39	2.86	0.19
Southern Indian Lake-Area 6	Spring	16	0.80	0.31	2.08	0.75	8.03	0.50
	Summer	13	0.60	0.19	1.29	0.50	3.65	0.28
	Fall	15	0.53	0.14	1.24	0.46	3.47	0.23
Southern Indian Lake-Area 4	Spring	11	0.79	0.43	1.66	0.69	5.25	0.48
	Summer	14	0.79	0.34	1.83	0.69	6.24	0.45
	Fall	9	0.44	0.20	1.03	0.47	2.80	0.31
Gauer Lake	Summer 2008	35	0.85	0.19	2.29	0.65	9.91	0.28
	Spring 2009	20	0.73	0.19	1.83	0.61	6.22	0.31
	Summer 2009	34	0.89	0.27	2.52	0.71	12.42	0.37
	Fall 2009	37	0.83	0.16	2.25	0.62	9.46	0.26

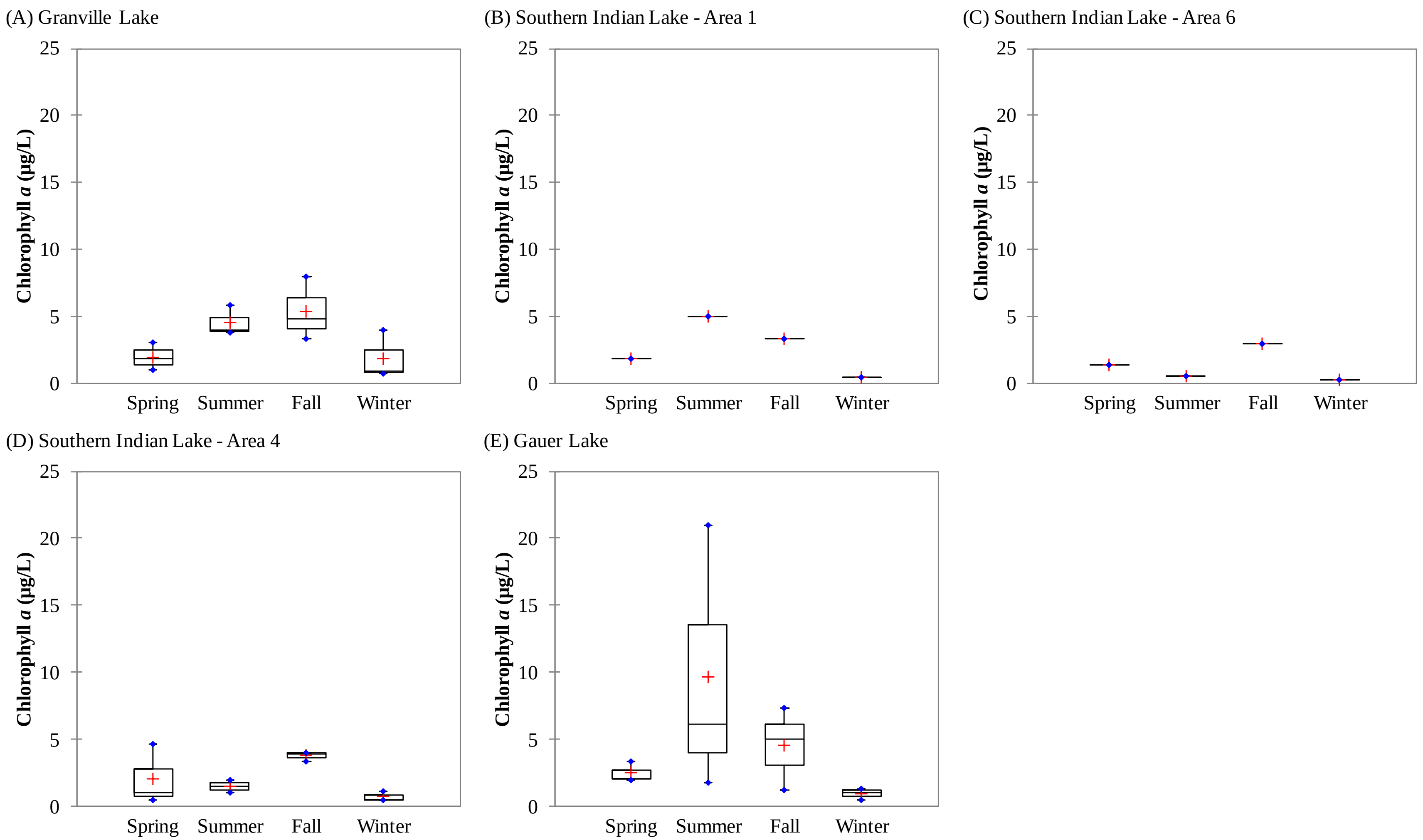


Figure 5.3.5-1. Chlorophyll *a* concentrations measured in the Upper Churchill River Region, 2008-2010 (Granville Lake, Southern Indian Lake-Area 4, and Gauer Lake), 2009 (Southern Indian Lake-Area 1), and 2010 (Southern Indian Lake-Area 6). No statistically significant seasonal differences were found for any of the annual waterbodies.

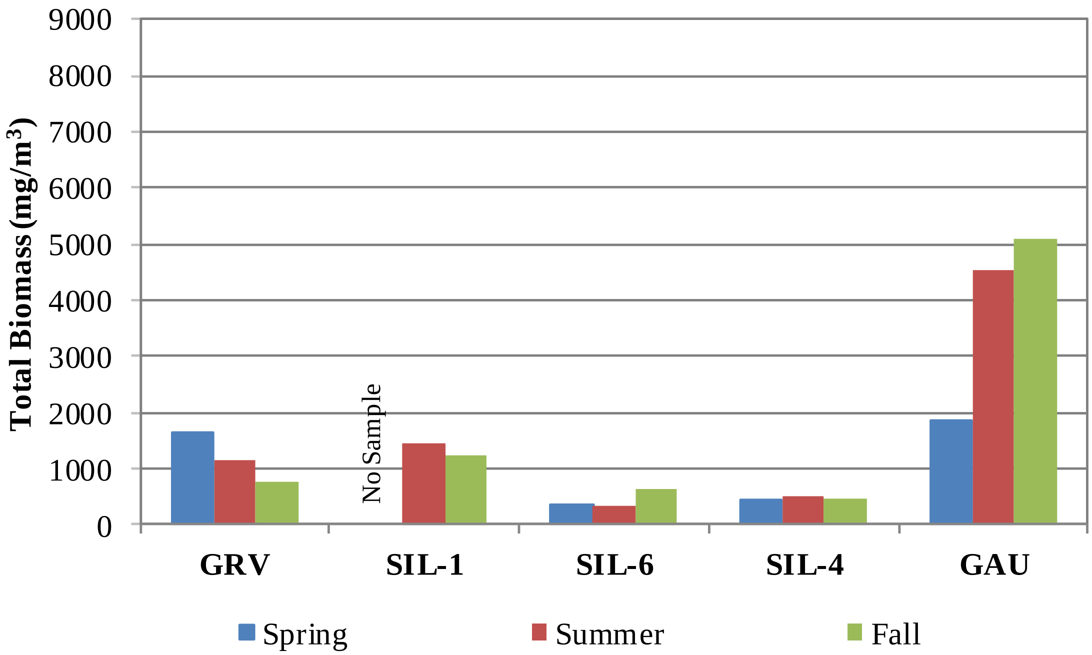


Figure 5.3.5-2. Phytoplankton biomass measured in the Upper Churchill River Region during the open-water seasons of 2008 (Gauer Lake, summer), 2009 (Granville Lake, Southern Indian Lake-Area 1, Southern Indian Lake-Area 4, and Gauer Lake) and 2010 (Southern Indian Lake-Area 6).

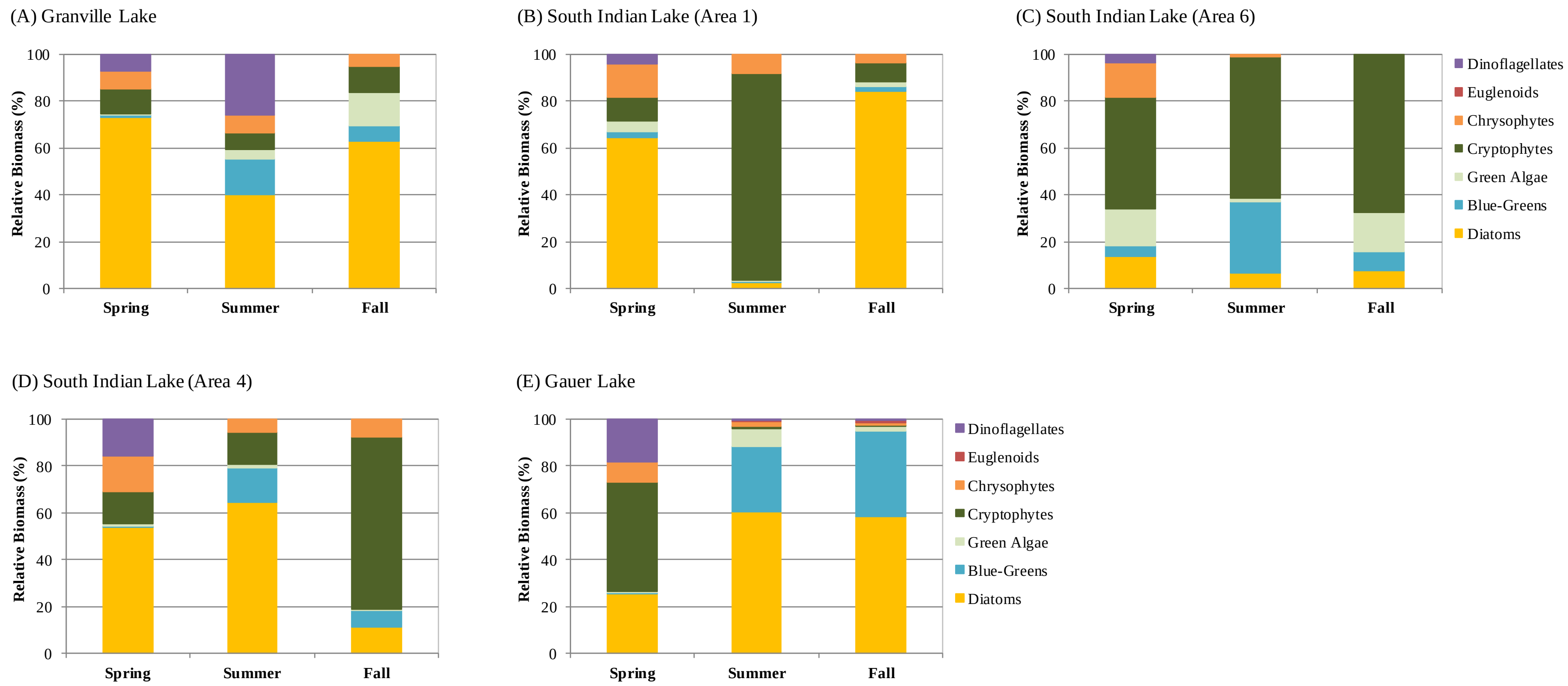


Figure 5.3.5-3. Phytoplankton community composition in the Upper Churchill River Region by season, as measured during the open-water seasons of 2009 (Granville Lake, Southern Indian Lake-Area 1, Southern Indian Lake-Area 4, and Gauer Lake) and 2010 (Southern Indian Lake-Area 6).

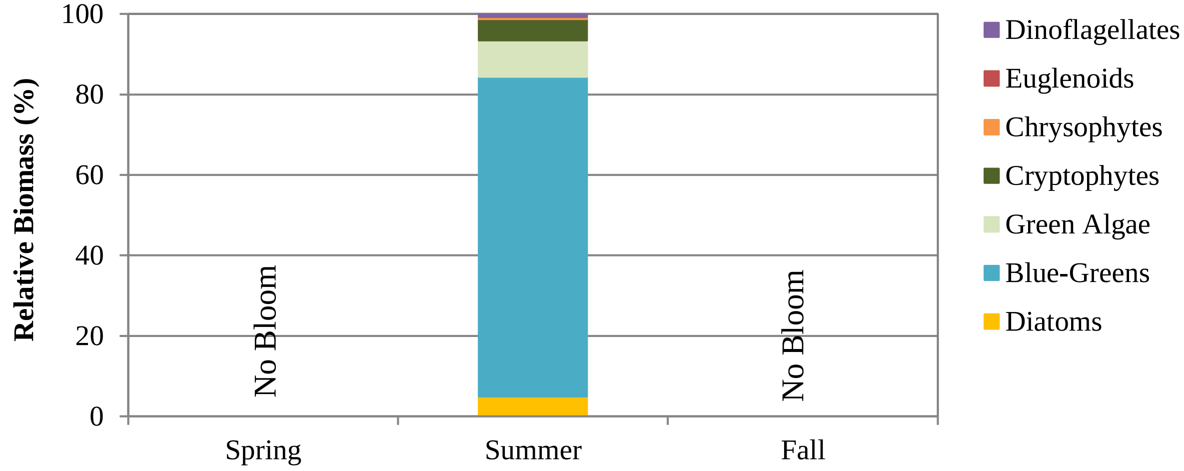


Figure 5.3.5-4. Phytoplankton community composition in Gauer Lake, 2008.

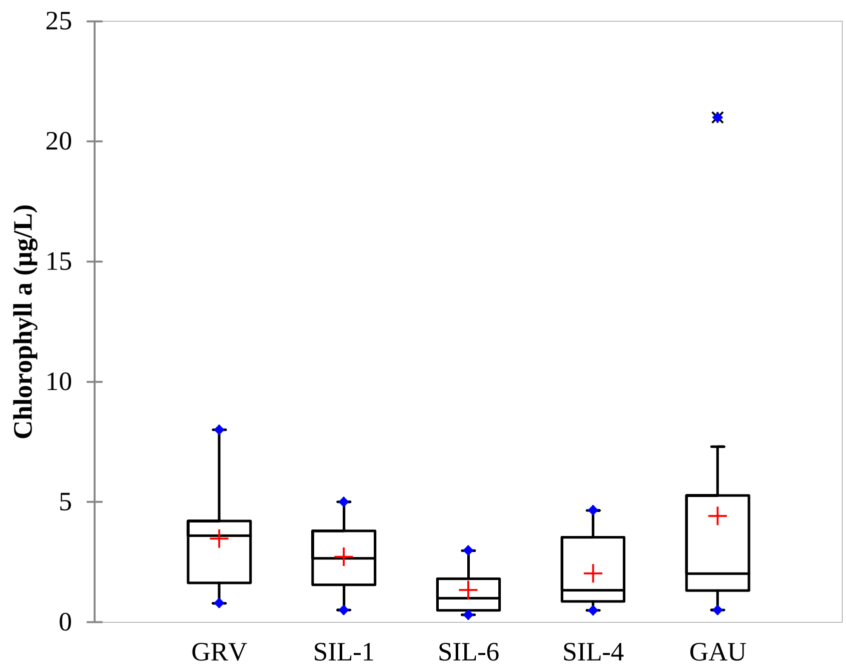


Figure 5.3.5-5. Chlorophyll *a* concentrations in the Upper Churchill River Region. No statistically significant spatial differences were detected between the annual waterbodies.

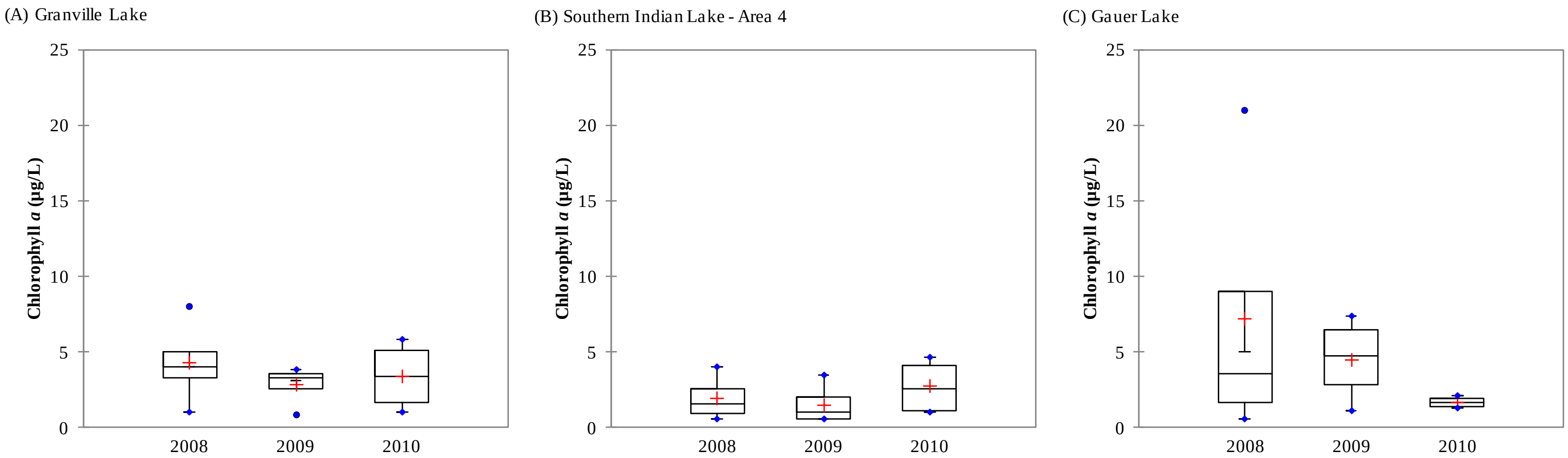


Figure 5.3.5-6. Chlorophyll *a* concentrations measured at the annual waterbodies in the Upper Churchill River Region by year. No statistically significant temporal differences were found.

5.3.6 Benthic Macroinvertebrates

The following provides an overview of the benthic macroinvertebrate (BMI) community sampled over the three year CAMPP program in the Upper Churchill River Region (Figure 5.3.6-1). In 2008, BMI sampling was conducted in the on-system lake Southern Indian Lake-Area 4 and the off-system waterbodies, Granville and Gauer lakes. These lakes are sampled annually. In 2009, sampling was conducted in the on-system waterbodies, Southern Indian Lake-Area 1 and Southern Indian Lake-Area 4, and in the off-system waterbodies, Granville and Gauer lakes. Southern Indian Lake-Area 1 is sampled on a rotational basis (i.e., once every three years). In 2010, sampling was conducted in the on-system lakes Southern Indian Lake-Area 6 and Southern Indian Lake-Area 4, and in the off-system waterbodies, Granville and Gauer lakes. Southern Indian Lake-Area 6 is sampled on a rotational basis. Nearshore and offshore habitat polygons were sampled in all waterbodies, except at Southern Indian Lake-Area 4 and Granville Lake in 2008 where nearshore polygons were not sampled due to inability to comply with the water depth/substrate criteria within the pre-determined polygons of the initial study design. BMI sampling was conducted in mid- to late-August each year; in 2008, Granville Lake was sampled in late-September.

BMI are described for waterbodies in the Upper Churchill River Region, including results of statistical analyses to evaluate spatial and temporal differences. In 2010, the sampling design was modified to incorporate kicknet sampling at all nearshore sites (intermittently wetted aquatic habitat). For this reason, a three year synthesis of the data for the predominantly wetted nearshore habitat was not possible and the 2010 nearshore data were described separately. The sampling design for the offshore habitat was comparable among the three years and offshore data were summarized for all waterbodies.

The primary objective of spatial comparisons (i.e., comparison between waterbodies) was to evaluate whether the BMI community differ between on-system sites. Comparisons were also made between the on-system waterbodies and the off-system waterbody. The BMI community would be expected to differ between on- and off-system waterbodies due to fundamental, inherent differences associated with the watersheds and waterbodies. The objective of the comparisons between the on- and off-system waterbodies was to formally identify differences between these areas to assist with interpretation of results of CAMP as the program continues.

Temporal comparisons were undertaken for each waterbody sampled annually in order to provide a preliminary assessment of temporal variability. As additional data are acquired, more formal trend analyses will be undertaken to evaluate potential longer-term changes.

5.3.6.1 Supporting Environmental Variables

Supporting environmental variables (biophysical) were measured in the field within nearshore and offshore polygons (where applicable) at each waterbody, and included water depth, water temperature, water velocity, Secchi depth, substrate type, type of riparian vegetation, and algal presence (Table 5.3.6-1). Benthic sediment samples were collected from BMI sampling sites and analyzed for particle size analysis (PSA) and total organic carbon (TOC). The nearshore habitat of Granville (2008), Southern Indian-Area 4 (2008) and all waterbodies sampled in 2010 consisted of mainly large, hard substrate, as such sediment samples were not collected for PSA and TOC analysis. In 2010, relative benchmarks were established along the shore at each waterbody to record the current water level and high water mark at the time of sampling.

In 2010, intermittently wetted nearshore water depths ranged between 0.5 m (Southern Indian Lake-Area 6 and Gauer Lake) and 1.0 m (Southern Indian Lake-Area 4) (Table 5.3.6-1). Within the predominantly wetted nearshore habitat sampled in 2008 and 2009, mean water depths ranged from 4.0 m (Granville Lake) to 4.3 m (Gauer Lake) (Table 5.3.6-1). Mean water depths on the offshore habitat (2008 to 2010) varied considerably, with values ranging from 9.2 m (South Indian Lake-Area 6) to 19.3 m (South Indian Lake-Area 4) (Table 5.3.6-1).

The intermittently wetted nearshore habitat (2010) consisted primarily of bedrock/boulder therefore no sediments were collected for PSA/TOC analysis. Nearshore benthic sediment sampled in 2008 to 2009 resulted in mean TOC values ranging between 1.5% (Southern Indian Lake-Area 1) and 3.6% (Gauer Lake) (Figure 5.3.6-2). In the offshore habitat (2008 to 2010), mean TOC ranged from 1.2% (Southern Indian Lake – Areas 6 and 4) to 7.7% (Gauer Lake) (Figure 5.3.6-3).

Sediment compositions (PSA) at the predominantly wetted nearshore sampling sites were variable between waterbodies. Granville Lake composed mainly of silt, and contained similar quantities of sand and clay; Southern Indian Lake-Area was was clay-dominated, with a notable amount of silt; Southern Indian Lake-Area 4 mainly contained sand and silt; and sediments at Gauer Lake were primarily sand (Figure 5.3.6-2). The offshore sites were predominantly sand and silt; except at Southern Indian Lake-Area 4 where the sediments were mainly sand (Figure 5.3.6-3).

5.3.6.2 Species Composition, Distribution, and Relative Abundance

<u>Granville Lake</u>

Mean BMI of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat of Granville Lake was 323 individuals (Table 5.3.6-2; Figure 5.3.6-4). Insects dominated the community and mainly consisted of Hemiptera, though Chironomidae, Ephemeroptera, and Trichoptera were also identified (Figures 5.3.6-5 and 5.3.6-6). The non-insects chiefly consisted of Gastropoda, Oligochaeta, and Amphipoda (Figure 5.3.6-6). Mean BMI density of benthic grab samples (n=15; 2009) collected in the predominantly wetted nearshore habitat of Granville Lake was 733 invertebrates/m^2 (Table 5.3.6-3; Figure 5.3.6-7). Non-insects dominated the BMI community, and consisted mainly of Amphipoda (scuds); Oligochaeta (aquatic worms), Bivalvia (clams), and a small number of Gastropoda (snails) (Figures 5.3.6-8 and 5.3.6-9). Insects mainly consisted of Ephemeroptera (mayflies) followed by Chironomidae (midges), and smaller numbers of Trichoptera (caddisflies) (Figure 5.3.6-9). Mean density of BMI collected in offshore benthic grab samples (n=35; 2008 to 2010) in Granville Lake was 1,824 individuals/m^2 (Table 5.3.6-4; Figure 5.3.6-10). Insects were slightly more abundant compared to non-insects (Figure 5.3.6-11). Insects consisted predominantly of Chironomidae and Ephemeroptera, and Trichoptera (Figure 5.3.6-12). Non-insects were dominated by Amphipoda; and Oligochaeta, and Bivalvia were also present (Figure 5.3.6-12).

Mean EPT (abundance of Ephemeroptera, Plecoptera, and Trichoptera) comprised 1% of the total BMI in nearshore kicknet samples and consisted of small numbers of mayflies and caddisflies (Table 5.3.6-2; Figure 5.3.6-13). Of the mayflies, Baetidae (*Procloeon* sp.; small minnow mayfly) was predominant (Table 5.3.6-2). Small numbers of Trichoptera; and no Plecoptera were not present in kicknet samples. Mean EPT comprised 11% and 24% of the total BMI community in the predominantly wetted nearshore and offshore grab samples, respectively (Tables 5.3.6-3 and 5.3.6-4; Figures 5.3.6-14 and 5.3.6-15). Of the EPT, ephemeropterans were proportionately most abundant in both nearshore and offshore habitats (Tables 5.3.6-3 and 5.3.6-4). Ephemeridae (*Hexagenia* sp., burrowing mayfly) was the only taxon identified in both near and offshore habitats (Tables 5.3.6-3 and 5.3.6-4). In the nearshore, small numbers of Trichoptera were identified; no Plecoptera were collected; no Trichoptera or Plecoptera were found in offshore grab samples (Tables 5.3.6-3 and 5.3.6-4). Mean EPT:C (ratio of EPT to Chironomidae) of nearshore kicknet samples was 0.26, indicating a more chironomid-dominated community (Table 5.3.6-2).Mean EPT:C was 0.70 and 0.73 in the predominantly wetted nearshore and offshore grab samples, respectively (Tables 5.3.6-3 and 5.3.6-4). Mean ratio values indicated a slightly chironomid-dominated community in both habitat types.

Three of a total 19 families (Hill's effective and taxonomic richness) dominated the BMI community in the intermittently wetted nearshore habitat (most notably, Corixidae; water boatmen) (Table 5.3.6-2). Mean richness for nearshore kicknet samples was 11 families (Figure 5.3.6-16). Three out of 14 BMI families dominated the predominantly wetted nearshore, and three of 13 families identified dominated the offshore community (Tables 5.3.6-3 and 5.3.6-4). Mean taxa richness for the nearshore was 4 families; and 5 families in the offshore (Figures

5.3.6-17 and 5.3.6-18). In both instances, Amphipoda (Haustoriidae) was the most abundant of the families identified (Tables 5.3.6-3 and 5.3.6-4). Mean diversity (Simpson's) was 0.38 in the intermittently wetted nearshore habitat; 0.51 in the predominantly wetted nearshore; and 0.49 in the offshore (Figures 5.3.6-19 to 5.3.6-21). Mean evenness (Simpson's equitability) was 0.12 intermittently wetted nearshore habitat; 0.64 in the predominantly wetted nearshore; and 0.52 in the offshore (Figures 5.3.6-19 to 5.3.6-21).

Southern Indian Lake-Area 1

Mean density of BMI from benthic grab samples (n=15; 2009) collected in the predominantly wetted nearshore habitat of South Indian Lake-Area 1 was 459 invertebrates/m^2 (Table 5.3.6-3; Figure 5.3.6-7). Insects and non-insects were near equally represented within the BMI community (Figure 5.3.6-8). Insects mainly consisted of Ephemeroptera followed by Chironomidae (Figure 5.3.6-9). Non-insects consisted mainly of Bivalvia and Oligochaeta; a smaller number of Gastropoda was also present (Figure 5.3.6-9). Mean BMI density in offshore benthic grab samples (n=15; 2009) was 1,094 individuals/m^2 (Table 5.3.6-4; Figure 5.3.6-10). The offshore BMI community consisted mainly of non-insects, predominantly consisting of Amphipoda, and smaller numbers of Bivalvia and Oligochaeta (Figures 5.3.6-11 and 5.3.6-12). Insects mainly consisted of Chironomidae and Ephemeroptera (Figure 5.3.6-12).

Mean EPT comprised 30% of the mean BMI density in the nearshore, consisting solely of mayflies (Table 5.3.6-3; Figure 5.3.6-14). Of the Ephemeroptera, Ephemeridae (*Hexagenia* sp.) was the only genus found to occur (Table 5.3.6-3). Neither Plecoptera nor Trichoptera were present in nearshore grab samples. In the offshore habitat, total EPT comprised 3% of the mean total BMI density (Table 5.3.6-4; Figure 5.3.6-15). As with the nearshore habitat, *Hexagenia* sp.was the only mayfly genus identified, and Trichoptera and Plecoptera were not present (Table 5.3.6-4). Mean EPT: C was 1.30 and 0.50 in the nearshore and offshore habitat, respectively, indicating an EPT-dominant community in the nearshore and a chironomid-dominated offshore habitat (Tables 5.3.6-3 and 5.3.6-4).

Three of the 11 families identified in the nearshore dominated the BMI community, namely Ephemeroptera (Ephemeridae), Gastropoda (Pisidiidae), and Oligochaeta (Table 5.3.6-3). Two of the six taxa identified in the offshore were proportionally most abundant (most notably, Amphipoda, (Haustoriidae) (Table 5.3.6-4). Mean taxa richness was 3 families for both near and offshore habitats (Figures 5.3.6-17 and 5.3.6-18). Mean diversity was 0.52 in the nearshore and 0.31 in the offshore (Figures 5.3.6-20 to 5.3.6-21). Mean evenness was 0.75 in the nearshore and 0.58 in the offshore (Figures 5.3.6-20 to 5.3.6-21).

Southern Indian Lake-Area 6

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat of South Indian Lake-Area 6 was 100 individuals (Table 5.3.6-2; Figure 5.3.6-4). Insects dominated the BMI community, mainly consisting of Ephemeroptera, Trichoptera, and Chironomidae (Figures 5.3.6-5 and 5.3.6-6). Non-insects consisted of Gastropoda, Amphipoda and Oligochaeta (Figure 5.3.6-6). Mean BMI density in offshore benthic grab samples (n=5; 2010) was 643 individuals/m^2 (Table 5.3.6-4; Figure 5.3.6-10). Non-insects dominated the BMI community, consisting mainly of Amphipoda; Bivalvia, Gastropoda, and Oligochaeta (Figures 5.3.6-11 and 5.3.6-12). Insects consisted of Chironomidae followed by Ephemeroptera (Figure 5.3.6-12).

Mean EPT comprised 6% and 9% of the mean total BMI in the intermittently wetted nearshore and offshore habitats, respectively (Tables 5.3.6-2 and 5.3.6-4; Figures 5.3.6-13 and 5.3.6-15). In the nearshore, mayflies were more abundant than caddisflies, and stoneflies were not found to occur (Table 5.3.6-2). Baetidae (*Procloeon* sp.) was the most dominant mayfly genus; although an unidentified Baetidae was also present (Table 5.3.6-2). In the offshore, mayflies were the singly represented of the EPT, with *Hexagenia* sp. as the only mayfly genus; neither Plecoptera nor Trichoptera were present in the offshore habitat (Table 5.3.6-4). Mean EPT: C was 8.73 in the nearshore, indicating an EPT-dominated community in the intermittently exposed nearshore habitat (Table 5.3.6-2). Mean EPT: C was 0.73 in the offshore, indicating a leaning towards a chironomid-dominant community with respect to EPT abundance (Table 5.3.6-4).

Four out of the 20 families identified in the intermittently wetted nearshore significantly contributed to the overall community composition (most notably, Corixidae) (Table 5.3.6-2). Mean taxa richness was 12 families (Figure 5.3.6-16). In the offshore, four of eight families identified dominated the community, most notably Amphipoda (Haustoriidae), followed by Chironomidae (Table 5.3.6-4). Mean taxa richness was 6 families (Figure 5.3.6-18). Mean diversity was 0.59 in the nearshore; and 0.67 in the offshore (Figures 5.1.6-19 and 5.1.6-21). Mean evenness was 0.20 in the nearshore and 0.47 in the offshore (Figures 5.1.6-19 and 5.1.6-21).

Southern Indian Lake-Area 4

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat of South Indian Lake-Area 4 was 110 individuals (Table 5.3.6-2; Figure 5.3.6-4). Insects dominated the BMI community, and consisted of Chironomidae and smaller numbers of Ephemeroptera and Trichoptera (Figures 5.3.6-5 and 5.3.6-6). Non-insects consisted mainly of Oligochaeta, with Bivalvia, Amphipoda, and Gastropoda also present (Figure 5.3.6-6). Mean

BMI density of benthic grab samples (n=15, 2009) collected in the predominantly wetted nearshore habitat was 3,512 individuals/m^2 (Table 5.3.6-3; Figure 5.3.6-7). Insects and non-insects were equally represented within the BMIcommunity in terms of abundance (Figure 5.3.6-8). Non-insects mainly consisted of Oligochaeta, Amphipoda, and Bivalvia; and smaller numbers of Gastropoda (Figure 5.3.6-9). Of the insects, Chironomidae predominated; though small abundances of Trichoptera and Ephemeroptera were also present (Figure 5.3.6-9). Mean BMI density in offshore benthic grab samples (n=35; 2008 to 2010) was 2,132 individuals/m^2 (Table 5.3.6-4; Figure 5.3.6-10). Non-insects were proportionately more abundant than insects, consisting predominantly of Amphipoda; Oligochaeta and small numbers of Bivalvia and Gastropoda were also present (Figures 5.3.6-11 and 5.3.6-12). Insects consisted mainly of Chironomidae (Figure 5.3.6-12).

Mean EPT intermittently wetted nearshore habitat comprised 4% of the total BMI abundance, with Ephemeroptera being the most dominant group (Table 5.3.6-2; Figure 5.3.6-13). *Caenis* sp. (Caenidae) was the dominant mayfly in the nearshore kicknet samples (Table 5.3.6-4). Trichoptera was represented in small numbers and Plecoptera was not found to occur (Table 5.3.6-4). Mean EPT comprised less than 1% of the mean BMI total in the predominantly wetted nearshore habitat, with mayflies and caddisflies both present in relatively small numbers (Table 5.3.6-3; Figure 5.3.6-14). *Hexagenia* sp. (Ephemeridae) and *Caenis* sp. (Caenidae) were the only mayflies found to occur and were in equal proportions (Table 5.3.6-3). Trichoptera was represented by three families, and no Plecoptera were collected. In the offshore habitat, the EPT index was zero (Table 5.3.6-4; Figure 5.3.6-15). Mean EPT: C for nearshore kicknet samples was 0.15, indicating a chironomid-dominated community with respect to abundance of EPT (Table 5.3.6-2). Mean EPT: C was 0.01 in the predominantly-wetted nearshore habitat, indicating a chironomid-dominated community with respect to EPT abundance (Table 5.3.6-3). Mean EPT: C for the offshore habitat was zero (Table 5.3.6-4).

In kicknet samples, six out of the 28 families dominated the intermittently wetted nearshore habitat (mainly Chironomidae), with a mean taxa richness of 14 families (Table 5.3.6-2; Figure 5.3.6-16). Five out of 15 families dominated the predominantly wetted nearshore habitat (mainly Chironomidae) with a mean taxa richness of 5 families (Table 5.3.6-3; Figure 5.3.6-17). Two families dominated the offshore habitat (most notably, Amphipoda (Haustoriidae)), with a mean richness value of 4 families (Table 5.3.6-4; Figure 5.3.6-18). Diversity index for kicknet samples was 0.70; and evenness was 0.23 (Figure 5.3.6-19).Mean diversity was 0.73 in the nearshore and 0.41 in the offshore (Figures 5.3.6-20 to 5.3.6-21). Mean evenness was 0.59 in the nearshore and 0.45 in the offshore (Figures 5.3.6-20 to 5.3.6-21).

Gauer Lake

Mean BMI abundance of kicknet samples (n=5; 2010) collected in the intermittently wetted nearshore habitat was 180 individuals (Table 5.3.6-2; Figure 5.3.6-4). Insects dominated the BMI community (Table 5.3.6-2; Figure 5.3.6-5) and were dominated by Corixidae (water boatmen; Hemiptera). Non-insects mainly consisted of Amphipoda and Gastropoda (Figures 5.3.6-5 and 5.3.6-6). Mean BMI density of benthic grab samples (n=27; 2008 to 2009) collected in the predominantly wetted nearshore habitat of Gauer Lake was 5,375 individuals/m^2 (Table 5.3.6-3; Figure 5.3.6-7). Composition of the BMI community was nearly equal between insects and non-insects (51% and 49%, respectively) (Figure 5.3.6-8). Insects were comprised mainly of Chironomidae; and of the non-insects, Oligochaeta and Bivalvia were predominant (Figure 5.3.6-9). Mean BMI density collected in offshore grab samples (n=35; 2008 to 2010) was 3,758 individuals/m^2 (Table 5.3.6-4; Figure 5.3.6-10). Non-insects dominated the community and mainly consisted of Oligochaeta, followed in abundance by Bivalvia (Figures 5.3.6-11 and 5.3.6-12). Within Insecta, Chironomidae was the dominant taxa (Figure 5.3.6-12).

Total EPT for kicknet samples comprised 2% of the BMI community in the intermittently wetted nearshore (Figure 5.3.6-13). Mayflies were dominant of the EPT and Heptageniidae (*Stenomena* sp.) was most abundant (Table 5.3.6-2). A small number of Trichoptera was also present. In grab samples, mean EPT comprised 2% and 1% of the BMI community in the predominantly wetted nearshore and offshore habitats, respectively (Tables 5.3.6-3 and 5.3.6-4; Figures 5.3.6-14 and 5.3.6-15). Ephemeroptera were the most abundant EPT taxa the nearshore; numbers of Ephemeroptera and Trichoptera were similar the offshore habitat (Tables 5.3.6-3 and 5.3.6-4). Ephemeridae (*Hexagenia* sp.) was the dominant mayfly in both habitats; while singly represented in the offshore samples, *Ephemera* sp. (Ephemeridae) was found in nearshore samples (Tables 5.3.6-3 and 5.2.6-4). Results from the nearshore kicknet samples indicated that the EPT were dominant (2.89) compared to chironomid abundance (Table 5.3.6-2). Mean EPT: C was 0.13 and 0.02 in the predominantly wetted nearshore and offshore habitats, respectively; indicating that both the nearshore and offshore communities were chironomid-dominated with respect to abundance of EPT (Tables 5.3.6-3 and 5.3.6-4).

Three out of the 25 families identified from kicknet samples dominated the intermittently wetted nearshore, most notably Corixidae (Table 5.3.6-2). Mean taxonomic richness was 13 families (Figure 5.3.6-16). Total taxonomic richness values were similar in the predominantly wetted nearshore (15 families) and offshore (12 families) habitats of Gauer Lake; as were the mean taxa richness values (Tables 5.3.6-3 and 5.3.6-4; Figures 5.3.6-17 and 5.3.6-18). Three families identified in the predominantly wetted nearshore contributed to the overall taxonomic composition; 4 families identified in offshore samples dominated (Tables 5.3.6-3 and 5.3.6-4). In both habitats, the dominant taxa were Chironomidae, Oligochaeta, and Bivalvia (Pisidiidae) (Tables 5.3.6-3 and 5.3.6-4). Diversity and evenness values of the intermittently wetted nearshore habitat were 0.29 and 0.11 respectively (Figure 5.3.6-19). Simpson's diversity index and evenness values were similar in near and offshore grab samples (Figures 5.3.6-20 and 5.3.6-21).

5.3.6.3 Spatial Comparisons

Differences amongst sites were detected in BMI abundance and richness metrics for the intermittently wetted nearshore habitat of Granville Lake (off-system), Southern Indian Lake-Area 4 (on-system), and Gauer Lake (off-system) were detected. Statistical analysis only incorporated one year of data (2010), therefore trends were difficult to assess between waterbodies (Figures 5.3.6-4 to 5.3.6-6; 5.3.6-13, 5.3.6-16, 5.3.6-19). Mean abundance of BMI was significantly greater in Granville Lake, and abundances of the major macroinvertebrate groups varied considerably between waterbodies (Figures 5.3.6-4 to 5.3.6-6).

Differences amongst sites were detected in BMI abundance and richness metrics for the predominantly wetted nearshore habitat of Granville Lake, Southern Indian Lake-Area 4, and Gauer Lake were detected. Statistical analysis only incorporated one year of data for Granville Lake and Southern Indian Lake-Area 4 (2009); and two years of data for Gauer Lake (2008 to 2009). Trends were difficult to assess as the majority of the measures varied significantly between all waterbodies (Figures 5.3.6-7 to 5.3.6-8, 5.3.6-14, 5.3.6-17, 5.3.6-20). Mean abundance of mayflies and total EPT were similar between Granville and Gauer lakes and significantly greater than in Southern Indian Lake – Area 4 (Figures 5.3.6- 9 and 5.3.6-14).

Differences amongst sites were detected in BMI abundance and richness metrics for the offshore habitat of Granville Lake, Southern Indian Lake-Area 4, and Gauer Lake were detected. Statistical analysis incorporated three years of data (2008 to 2010); however trends were difficult to assess (Figures 5.3.6-10 to 5.3.6-12, 5.3.6-15, 5.3.6-18, 5.3.6-21). Granville Lake and Southern Indian Lake-Area 4 appeared to be similar with respect to abundance of macroinvertebrates, insects, oligochaetes, amphipods, gastropods, and chironomids (Figures 5.3.6-10 to 5.3.6-12). Granville and Gauer lakes were most similar with respect to abundance of non-insects and taxonomic richness (Figures 5.3.6-10 and 5.3.6-18).

Future evaluations of spatial variability or trends will be undertaken when additional data are acquired for the region.

5.3.6.4 Temporal Variability

Preliminary power analysis of the initial CAMPP study design (implemented in 2008 and 2009) showed that the BMI community metrics differed considerably among samples within the same habitat type and the delineation between nearshore and offshore polygon locations was sometimes indistinct. The inherent variablilty of this data made it difficult to explain and relate "significant" results with confidence to other components of CAMPP (e.g., hydrology and water quality).

The initial BMI study design was refined and implemented in the 2010 field season. The study design was changed with respect to site selection within nearshore and offshore polygons, and nearshore sampling methods. The objective of the refined BMI program was to minimize the inherent variability and increase the power of the BMI data to detect statistically significant variabililty or trends over time. As additional data are acquired for the region under the refined program, analyses will be undertaken to evaluate potential long-term changes in BMI community metrics and to link significant trends to the other CAMP components.

Temporal differences in BMI abundance and richness metrics for the offshore habitat of Granville Lake were detected. Analysis incorporated three years of data (2008 to 2010) and it appears that all of the metrics varied between years, except for EPT:C (Figures 5.3.6-22 to 5.3.6-27). Overall, trends were difficult to assess, however abundances of non-insects, oligochaetes, and amphipods were significantly greater in 2009 than in 2008 and 2010; and abundance of bivalves were significantly less. Abundances of insects, chironomids, mayflies, and caddisflies, and mean taxonomic richness were significantly greater in 2010 than in 2008 and 2009 (Figures 5.3.6-22 to 5.3.6-27). Simpson's diversity index varied significantly between all years. Simpson's evenness values also varied, though some overlap was detected between 2008 and 2010 (Figure 5.3.6-27).

Temporal differences were detected in the BMI metrics for the offshore habitat of Southern Indian Lake-Area 4. Analysis incorporated three years of data (2008 to 2010) and it appears that the majority of metrics varied between years, except for abundance of bivalves, and Simpson's, Shannon's, and Hill's evenness values (Figures 5.3.6-28 to 5.3.6-33). The majority of differences were detected within the 2010 data, which were significantly less for all abundance measures (Figures 5.3.6-28 to 5.3.6-31). Taxonomic richness and Simpson's diversity index were significantly greater in 2010 when compared to 2008 and 2009 (Figures 5.3.6-32 to 5.3.6-33).

Temporal differences in BMI abundance and richness metrics for the nearshore and offshore habitats of Gauer Lake is discussed in the Lower Churchill River Region (Section 5.4.6).

Table 5.3.6-1. Habitat and physical characteristics recorded at benthic macroinvertebrate sites in the Upper Churchill River Region for CAMPP, 2008 to 2010.

Waterbody	Habitat Type	No. of Samples (n)	Water Depth Mean (m)	Water Depth Min (m)	Water Depth Max (m)	Mean Water Velocity (m/sec)	Mean Secchi Depth (m)	Water Temperature (°C)	Predominant Substrate	Riparian Vegetation	Canopy Cover (%)	Algae
Granville Lake (2008)	Nearshore	0	--	--	--	--	--	--	--	--	--	--
	Offshore	15	12.7	11.5	13.7	--	--	--	--	--	--	--
Southern Indian Lake-Area 4 (2008)	Nearshore	0	--	--	--	--	--	--	--	--	--	--
	Offshore	15	20.9	15.6	23.3	--	--	--	--	--	--	--

Table 5.3.6-1. continued.

Waterbody	Habitat Type	No. of Samples	Water Depth			Mean Water Velocity	Mean Secchi Depth	Water Temperature	Predominant Substrate	Riparian Vegetation	Canopy Cover	Algae
			Mean	Min	Max							
		(n)	(m)	(m)	(m)	(m/sec)	(m)	(°C)			(%)	
Granville Lake (2009)	Nearshore	15	4.0	1.3	5.0	--	1.01	17.0	--	shrubs, coniferous	0	--
	Offshore	15	13.8	12.8	14.6	--	0.94	17.0	--	--	0	--
Southern Indian Lake-Area 1 (2009)	Nearshore	15	4.3	2.6	4.9	--	0.50	16.0	--	shrubs, coniferous	0	--
	Offshore	15	13.3	11.7	14.7	--	0.60	15.0	--	--	0	--
Southern Indian Lake-Area 4 (2009)	Nearshore	15	4.1	2.8	4.9	--	1.43	14.0	--	coniferous	0	--
	Offshore	15	21.2	17.6	23.1	--	1.61	13.5	--	--	0	--

Table 5.3.6-1. continued.

Waterbody	Habitat Type	No. of Samples	Water Depth			Mean Water Velocity	Mean Secchi Depth	Water Temperature	Predominant Substrate	Riparian Vegetation	Canopy Cover	Algae
			Mean	Min	Max							
		(n)	(m)	(m)	(m)	(m/sec)	(m)	(°C)			(%)	
Granville Lake (2010)	Nearshore	5	0.6	0.4	0.8	0.00	0.63	15.5	bedrock, boulder	coniferous	0-24	attached
	Offshore	5	9.1	8.8	9.3	0.02	1.19	15.0	clay, organic matter	--	--	0
Southern Indian Lake-Area 6 (2010)	Nearshore	5	0.5	0.4	0.6	0.01	0.61	15.0	boulder, gravel	shrubs, mixed forest	0-24	attached
	Offshore	5	9.2	9.1	9.3	0.00	0.52	14.0	clay	--	--	0
Southern Indian Lake-Area 4 (2010)	Nearshore	5	1.0	0.8	1.2	0.02	1.23	17.0	boulder	mixed forest	0-24	periphyton, attached
	Offshore	5	8.9	8.6	9.2	0.17	1.43	16.0	silt, gravel	--	--	0

Table 5.3.6-2. Summary statistics calculated from the taxonomic analysis of benthic macroinvertebrate nearshore kicknet samples collected in the Upper Churchill River Region for CAMPP, 2010.

Waterbody and Habitat	Granville Lake Nearshore (2010)							Southern Indian Lake-Area 6 Nearshore (2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	5							5						
Water Depth (m)	--	0.6	0.15	0.07	0.6	0.4	0.8	--	0.5	0.06	0.03	0.5	0.4	0.6
Abundance (no. per kicknet)														
Total Invertebrates	--	323	84.0	37.6	294	248	424	--	100	67.0	30.0	90	37	211
Non-Insecta	12	39	15.0	6.7	41	21	60	35	35	23.3	10.4	31	12	60
Oligochaeta	4	14	8.9	4.0	17	3	24	6	6	6.8	3.0	3	1	17
Amphipoda	3	9	7.0	3.1	6	4	21	13	13	14.9	6.7	5	3	38
Bivalvia	0	0	0.0	0.0	0	0	0	0	0	0.1	0.1	0	0	0
Gastropoda	5	16	12.8	5.7	12	3	32	16	16	9.5	4.3	14	6	27
Insecta	88	284	81.4	36.4	273	205	372	65	65	51.0	22.8	47	25	151
Chironomidae	9	27	20.1	9.0	15	9	54	1	1	1.6	0.7	1	0	4
Ephemeroptera	1	2	2.4	1.1	1	0	5	4	4	3.1	1.4	3	1	7
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	1	2	1.6	0.7	1	0	4	3	3	3.1	1.4	1	1	8
EPT	1	4	2	1	4	0	6	6	6	5.5	2.5	4	1	15
EPT to Chironomidae Ratio	--	0.26	0.199	0.089	0.39	0.00	0.43	--	8.73	10.825	4.841	3.00	0.00	25.00
Genus analysis of Ephemeroptera	Baetidae: *Procloeon*	--	--	--	--	--	--	Baetidae: *Procloeon*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	19	11	3.1	1.4	12	7	14	20	12	2.5	1.1	12	10	16
Simpson's Diversity Index	--	0.38	0.093	0.041	0.43	0.23	0.45	--	0.59	0.118	0.053	0.57	0.45	0.78
Evenness (Simpson's Equitability)	--	0.12	0.031	0.014	0.13	0.08	0.16	--	0.19	0.045	0.020	0.18	0.15	0.25
Shannon-Weaver Index	--	0.96	0.203	0.091	0.99	0.66	1.18	--	1.37	0.334	0.149	1.30	1.06	1.93
Evenness (Shannon's Equitability)	--	0.37	0.078	0.035	0.39	0.23	0.43	--	0.52	0.087	0.039	0.51	0.43	0.67
Hill's Effective Richness	--	3	0.5	0.2	2.7	2	3	--	4	1.6	0.7	3.7	3	7
Evenness (Hill's)	--	0.20	0.049	0.022	0.21	0.11	0.24	--	0.30	0.055	0.025	0.28	0.24	0.38

Table 5.3.6-2. continued.

Waterbody and Habitat	Southern Indian Lake-Area 4 Nearshore (2010)							Gauer Lake Nearshore (2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	5							5	--	--	--	--	--	--
Water Depth (m)	--	1.0	0.14	0.06	1.0	0.8	1.2	--	0.5	0.11	0.05	0.5	0.4	0.7
Abundance (no. per kicknet)														
Total Invertebrates	--	110	60.6	27.1	112	26	196	--	180	115	51.2	132.3	51	330
Non-Insecta	23	25	29.7	13.3	14	8	78	6	11	6	2.7	11.3	4	19
Oligochaeta	15	17	23.9	10.7	6	5	60	0	0	0	0.1	0.3	0	1
Amphipoda	2	2	2.8	1.2	0	0	7	3	5	5	2.1	2.7	1	10
Bivalvia	3	4	2.3	1.0	3	1	7	0	1	1	0.4	0.7	0	2
Gastropoda	2	2	3.6	1.6	1	0	9	2	4	3	1.3	2.7	2	9
Insecta	77	85	66.4	29.7	83	18	185	94	169	117	52.4	117.3	32	319
Chironomidae	61	67	53.8	24.1	76	10	142	1	1	1	0.5	1.7	0	3
Ephemeroptera	3	3	1.5	0.7	2	2	5	2	4	3	1.5	2.7	1	9
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0	0.0	0.0	0	0
Trichoptera	1	1	0.8	0.4	1	0	2	0	1	1	0.4	0.7	0	2
EPT	4	4	1.9	0.8	4	2	7	2	4	3	1.5	4.7	1	10
EPT to Chironomidae Ratio	--	0.15	0.162	0.072	0.08	0.02	0.42	--	2.89	2.92	1.30	2.33	0.00	7.50
Genus analysis of Ephemeroptera	Caenidae: *Caenis*	--	--	--	--	--	--	Heptageniidae: *Stenonema*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	28	14	2.1	0.9	14	12	17	25	13	4.0	1.8	11	9	18
Simpson's Diversity Index	--	0.69	0.114	0.051	0.67	0.56	0.88	--	0.29	0.277	0.124	0.13	0.10	0.73
Evenness (Simpson's Equitability)	--	0.23	0.163	0.073	0.18	0.13	0.52	--	0.59	0.468	0.209	0.71	0.08	1.13
Shannon-Weaver Index	--	1.73	0.327	0.146	1.71	1.33	2.23	--	0.80	0.699	0.312	0.40	0.30	1.90
Evenness (Shannon’s Equitability)	--	0.61	0.125	0.056	0.59	0.46	0.81	--	0.30	0.229	0.102	0.17	0.13	0.66
Hill's Effective Richness	--	6	2.1	0.9	5.6	4	9	--	3	2.3	1.0	1.5	1	7
Evenness (Hill's)	--	0.34	0.142	0.064	0.32	0.21	0.58	--	0.19	0.103	0.046	0.15	0.12	0.37

Table 5.3.6-3. Summary statistics calculated from the taxonomic analysis of benthic macroinvertebrate nearshore grab samples collected in the Upper Churchill River Region for CAMPP, 2008 to 2010.

Waterbody and Habitat	Granville Lake Nearshore (2009)							Southern Indian Lake-Area 1 Nearshore (2009)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	15	--	--	--	--	--	--	15	--	--	--	--	--	--
Water Depth (m)	--	4.0	1.29	0.33	4.5	1.3	5.0	--	4.3	0.55	0.14	4.4	2.6	4.9
Abundance (no. per m^2)														
Total Invertebrates	--	733	450.5	116.3	649	260	1818	--	459	359.8	92.9	346	130	1472
Non-Insecta	79	580	464.1	119.8	476	87	1688	47	214	298.3	77.0	87	0	1125
Oligochaeta	12	87	173.1	44.7	0	0	519	20	92	243.7	62.9	0	0	952
Amphipoda	62	453	426.9	110.2	346	0	1601	0	0	0.0	0.0	0	0	0
Bivalvia	4	32	57.8	14.9	0	0	173	22	101	110.6	28.5	43	0	303
Gastropoda	0	3	11.2	2.9	0	0	43	3	14	45.3	11.7	0	0	173
Insecta	21	153	98.0	25.3	173	0	346	53	245	160.8	41.5	173	87	649
Chironomidae	7	52	43.9	11.3	43	0	130	18	84	93.2	24.1	87	0	346
Ephemeroptera	11	78	83.7	21.6	43	0	260	30	139	164.6	42.5	87	0	519
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	1	6	15.2	3.9	0	0	43	0	0	0.0	0.0	0	0	0
EPT	11	84	87.3	22.5	43	0	260	30	139	164.6	42.5	87	0	519
EPT to Chironomidae Ratio	--	0.70	0.943	0.244	0.00	0.00	3.00	--	1.30	2.266	0.585	0.00	0.00	7.00
Genus analysis of Ephemeroptera	1 sp. (*Hexagenia*)	--	--	--	--	--	--	1 sp. (*Hexagenia*)	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	14	4	1.1	0.3	4	2	6	11	3	1.1	0.3	3	1	5
Simpson's Diversity Index	--	0.51	0.226	0.058	0.60	0.09	0.75	--	0.52	0.190	0.049	0.53	0.00	0.75
Evenness (Simpson's Equitability)	--	0.64	0.169	0.044	0.61	0.32	0.93	--	0.75	0.163	0.042	0.74	0.50	1.00
Shannon-Weaver Index	--	0.96	0.419	0.108	1.14	0.18	1.49	--	0.91	0.383	0.099	0.98	0.00	1.48
Evenness (Shannon's Equitability)	--	0.71	0.231	0.060	0.82	0.27	0.96	--	0.77	0.235	0.061	0.79	0.00	0.96
Hill's Effective Richness	--	3	1.0	0.3	3.1	1.2	5	--	3	0.9	0.2	2.7	1	4
Evenness (Hill's)	--	0.74	0.152	0.039	0.75	0.41	0.94	--	0.83	0.114	0.029	0.82	0.65	1.00

Table 5.3.6-3. continued.

Waterbody and Habitat	Southern Indian Lake-Area 4 Nearshore (2009)							Gauer Lake Nearshore (2008 to 2009)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	15	--	--	--	--	--	--	27	--	--	--	--	--	--
Water Depth (m)	--	4.1	0.57	0.15	4.0	2.8	4.9	--	4.3	0.88	0.17	4.5	1.3	5.2
Abundance (no. per m^2)														
Total Invertebrates	--	3512	1404.1	362.5	3549	1342	5583	--	5375	4746.9	913.5	6839	43	12119
Non-Insecta	52	1824	893.9	230.8	1991	346	3160	49	2624	2510.6	483.2	2251	0	7055
Oligochaeta	23	819	662.4	171.0	736	87	2467	29	1550	1546.2	297.6	736	0	4155
Amphipoda	19	658	682.0	176.1	346	0	2034	0	3	11.6	2.2	0	0	43
Bivalvia	10	335	154.7	40.0	303	87	693	18	994	1019.4	196.2	606	0	2986
Gastropoda	0	9	17.9	4.6	0	0	43	1	45	59.4	11.4	43	0	260
Insecta	48	1688	769.1	198.6	1558	519	3030	51	2749	2476.8	476.7	3073	0	7488
Chironomidae	47	1656	782.8	202.1	1515	476	3030	47	2547	2366.7	455.5	2900	0	7401
Ephemeroptera	0	6	15.2	3.9	0	0	43	2	99	98.9	19.0	87	0	433
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	0	12	25.7	6.6	0	0	87	0	14	31.8	6.1	0	0	130
EPT	0	17	27.4	7.1	0	0	87	2	114	106.8	20.6	87	0	433
EPT to Chironomidae Ratio	--	0.01	0.024	0.006	0.00	0.00	0.08	--	0.13	0.264	0.051	0.03	0.00	1.00
Genus analysis of Ephemeroptera	2 spp. (*Hexagenia* + *Caenis*)	--	--	--	--	--	--	Ephemeridae: *Hexagenia*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	15	5	1.0	0.3	5	4	7	15	6	2.6	0.5	7	1	10
Simpson's Diversity Index	--	0.73	0.064	0.017	0.77	0.62	0.82	--	0.61	0.157	0.030	0.65	0.00	0.80
Evenness (Simpson's Equitability)	--	0.59	0.104	0.027	0.60	0.44	0.76	--	0.35	0.292	0.056	0.22	0.00	1.00
Shannon-Weaver Index	--	1.52	0.194	0.050	1.58	1.23	1.89	--	1.18	0.383	0.074	1.23	0.00	1.83
Evenness (Shannon's Equitability)	--	0.80	0.068	0.018	0.81	0.69	0.91	--	0.74	0.242	0.047	0.74	0.00	1.09
Hill's Effective Richness	--	5	0.9	0.2	5	3	7	--	3	1.2	0.2	3	1	6
Evenness (Hill's)	--	0.69	0.087	0.022	0.69	0.57	0.85	--	0.68	0.268	0.052	0.60	0.34	1.10

Table 5.3.6-4. Summary statistics calculated from the taxonomic analysis of benthic macroinvertebrate offshore grab samples collected in the Upper Churchill River Region for CAMPP, 2008 to 2010.

Waterbody and Habitat	Granville Lake Offshore (2008 to 2010)							Southern Indian Lake-Area 1 Offshore (2009)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	35	--	--	--	--	--	--	15	--	--	--	--	--	--
Water Depth (m)	--	12.6	1.62	0.27	13.0	8.8	14.6	--	13.3	0.85	0.22	13.4	11.7	14.7
Abundance (no. per m^2)														
Total Invertebrates	--	1824	1144.4	193.4	1472	173	4328	--	1094	1006.8	260.0	563	130	2640
Non-Insecta	82	1499	1124.2	190.0	1125	130	4198	91	995	950.0	245.3	519	43	2467
Oligochaeta	9	170	164.4	27.8	130	0	476	1	12	25.7	6.6	0	0	87
Amphipoda	68	1243	1047.4	177.0	952	0	3766	86	944	895.6	231.2	476	43	2337
Bivalvia	5	82	94.2	15.9	43	0	346	4	40	62.2	16.1	0	0	173
Gastropoda	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Insecta	18	325	342.2	57.8	216	0	1443	9	98	110.3	28.5	87	0	433
Chironomidae	10	188	201.7	34.1	130	0	736	6	63	99.3	25.6	43	0	390
Ephemeroptera	6	118	159.8	27.0	87	0	750	3	32	30.5	7.9	43	0	87
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	0	2	5.8	1.0	0	0	29	0	0	0.0	0.0	0	0	0
EPT	7	120	164.4	27.8	87	0	765	3	32	30.5	7.9	43	0	87
EPT to Chironomidae Ratio	--	0.73	0.781	0.132	0.50	0.00	3.00	--	0.50	0.728	0.188	0.00	0.00	2.00
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*	--	--	--	--	--	--	1 sp. (*Hexagenia*)	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	13	5	1.9	0.3	4	1	10	6	3	1.1	0.3	3	1	5
Simpson's Diversity Index	--	0.48	0.191	0.032	0.47	0.00	0.82	--	0.31	0.185	0.048	0.27	0.00	0.67
Evenness (Simpson's Equitability)	--	0.52	0.529	0.089	0.39	0.20	3.33	--	0.58	0.248	0.064	0.56	0.26	1.01
Shannon-Weaver Index	--	0.99	0.408	0.069	0.96	0.00	1.82	--	0.56	0.292	0.075	0.51	0.00	1.10
Evenness (Shannon's Equitability)	--	0.60	0.210	0.036	0.61	0.00	0.95	--	0.53	0.280	0.072	0.49	0.00	1.00
Hill's Effective Richness	--	3	1.3	0.2	3	1	6	--	2	0.5	0.1	1.7	1	3
Evenness (Hill's)	--	0.57	0.196	0.033	0.52	0.28	1.00	--	0.66	0.224	0.058	0.62	0.33	1.00

Table 5.3.6-4. continued.

Waterbody and Habitat	Southern Indian Lake-Area 6 Offshore (2010)							Southern Indian Lake-Area 4 Offshore (2008 to 2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	5	--	--	--	--	--	--	35	--	--	--	--	--	--
Water Depth (m)	--	9.2	0.08	0.04	9.1	9.1	9.3	--	19.3	4.56	0.77	21.2	8.6	23.3
Abundance (no. per m^2)														
Total Invertebrates	--	643	461.1	206.2	476	274	1414	--	2132	1348.3	227.9	2164	173	5843
Non-Insecta	66	424	332.9	148.9	332	159	995	89	1897	1365.6	230.8	1904	130	5800
Oligochaeta	0	3	6.5	2.9	0	0	14	12	262	237.6	40.2	216	0	909
Amphipoda	54	346	300.7	134.5	231	115	866	75	1607	1190.7	201.3	1472	58	4891
Bivalvia	5	35	7.9	3.5	29	29	43	1	19	27.1	4.6	0	0	87
Gastropoda	3	20	24.1	10.8	14	0	58	0	1	5.4	0.9	0	0	29
Insecta	34	219	135.9	60.8	144	115	418	11	235	163.0	27.5	216	0	563
Chironomidae	23	147	125.5	56.1	72	43	317	11	233	160.7	27.2	216	0	563
Ephemeroptera	9	61	25.8	11.5	58	29	87	0	0	0.0	0.0	0	0	0
Plecoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
Trichoptera	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0	0	0
EPT	9	61	25.8	11.5	58	29	87	0	0	0.0	0.0	0	0	0
EPT to Chironomidae Ratio	--	0.73	0.738	0.330	0.40	0.24	2.00	--	0.00	0.000	0.000	0.00	0.00	0.00
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*	--	--	--	--	--	--	--	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	8	6	0.8	0.4	6	5	7	10	4	1.1	0.2	3	1	6
Simpson's Diversity Index	--	0.67	0.054	0.024	0.67	0.58	0.72	--	0.41	0.177	0.030	0.41	0.00	0.74
Evenness (Simpson's Equitability)	--	0.46	0.163	0.073	0.43	0.26	0.71	--	0.45	0.166	0.028	0.42	0.25	1.00
Shannon-Weaver Index	--	1.40	0.101	0.045	1.40	1.28	1.54	--	0.82	0.368	0.062	0.81	0.00	1.67
Evenness (Shannon's Equitability)	--	0.74	0.108	0.048	0.75	0.58	0.87	--	0.54	0.191	0.032	0.56	0.00	1.00
Hill's Effective Richness	--	4	0.4	0.2	4.1	4	5	--	2	1.0	0.2	2	1	5
Evenness (Hill's)	--	0.61	0.151	0.068	0.61	0.40	0.81	--	0.55	0.154	0.026	0.54	0.33	1.00

Table 5.3.6-4. continued.

Waterbody and Habitat	Gauer Lake Offshore (2008 to 2010)						
	Proportion (%)	Mean	SD	SE	Median	Min	Max
No. of Samples (n)	35	--	--	--	--	--	--
Water Depth (m)	--	13.7	4.14	0.70	14.0	6.0	20.6
Abundance (no. per m^2)							
Total Invertebrates	--	3758	2367.8	400.2	3246	822	12292
Non-Insecta	62	2318	1982.5	335.1	1991	216	9998
Oligochaeta	42	1571	1837.8	310.6	1068	216	9436
Amphipoda	0	1	7.3	1.2	0	0	43
Bivalvia	17	657	409.3	69.2	693	0	1948
Gastropoda	2	67	65.2	11.0	43	0	173
Insecta	38	1440	644.8	109.0	1428	433	2857
Chironomidae	37	1390	639.1	108.0	1385	390	2770
Ephemeroptera	0	9	17.8	3.0	0	0	43
Plecoptera	0	0	0.0	0.0	0	0	0
Trichoptera	0	11	24.3	4.1	0	0	87
EPT	1	21	32.9	5.6	0	0	130
EPT to Chironomidae Ratio	--	0.02	0.026	0.004	0.00	0.00	0.09
Genus analysis of Ephemeroptera	Ephemeridae: *Hexagenia*	--	--	--	--	--	--
No. of Samples with No Aquatic Invertebrates	0	--	--	--	--	--	--
No. Samples with Only OLIGO +/or CHIRON	0	--	--	--	--	--	--
Taxonomic Richness (Family-level)	12	5	1.7	0.3	5	2	10
Simpson's Diversity Index	--	0.65	0.111	0.019	0.70	0.33	0.77
Evenness (Simpson's Equitability)	--	0.37	0.246	0.042	0.28	0.14	1.51
Shannon-Weaver Index	--	1.29	0.260	0.044	1.35	0.51	1.65
Evenness (Shannon’s Equitability)	--	0.83	0.156	0.026	0.83	0.56	1.22
Hill's Effective Richness	--	4	0.8	0.1	4	2	5
Evenness (Hill's)	--	0.78	0.202	0.034	0.78	0.44	1.28

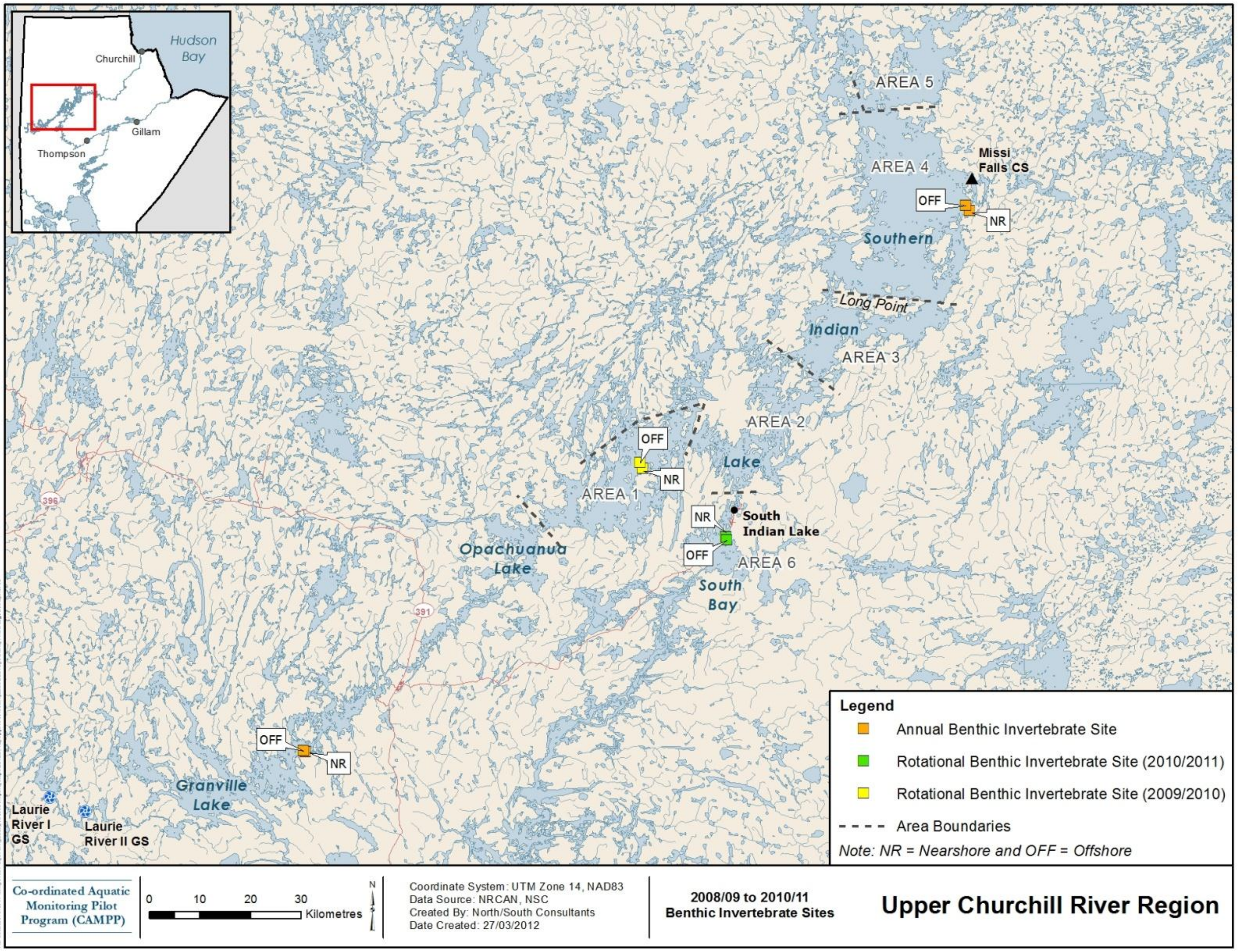


Figure 5.3.6-1. Benthic invertebrate sampling sites located in CAMPP waterbodies in the Upper Churchill River Region, 2008 to 2010.

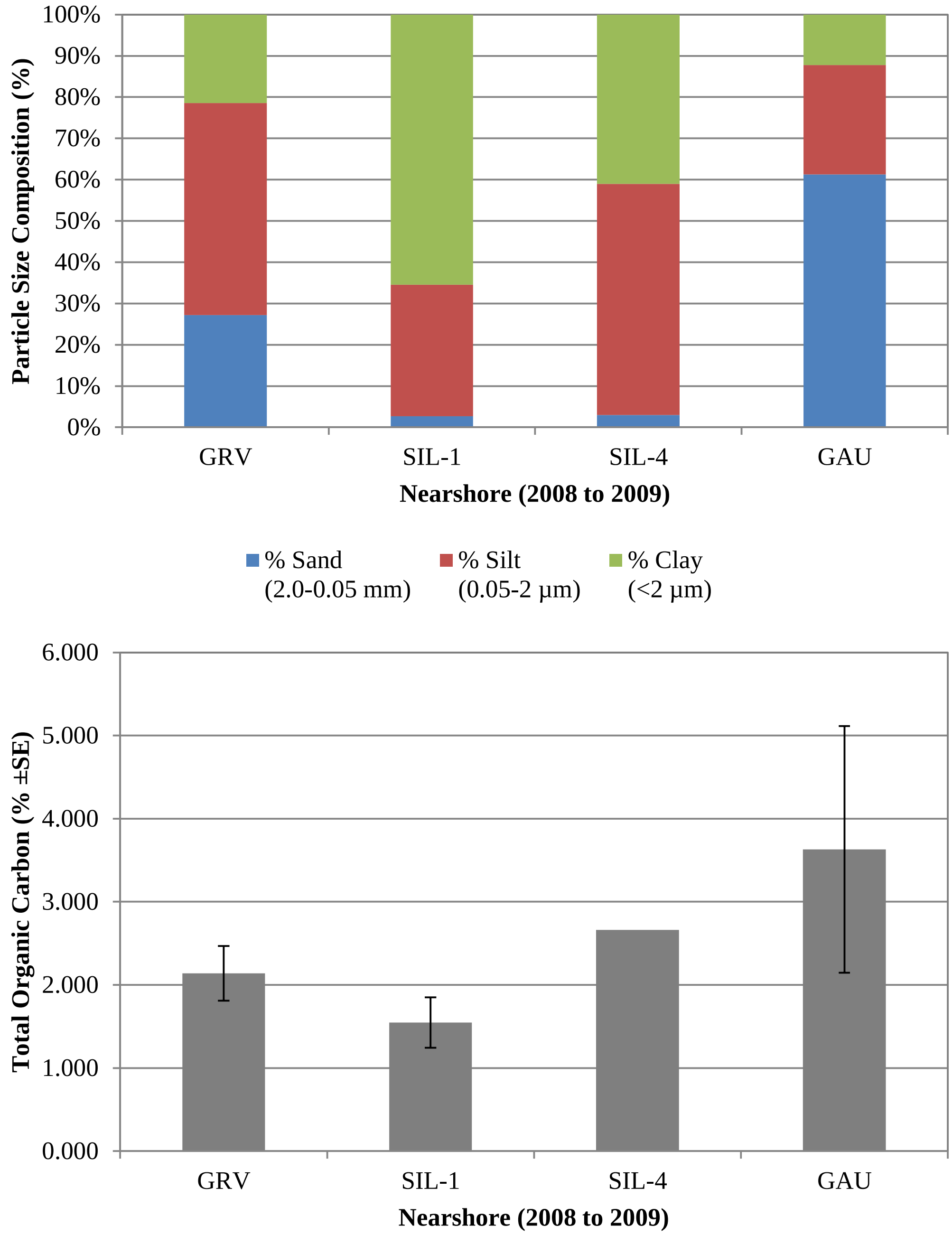


Figure 5.3.6-2. Sediment analyses (particle size composition and total organic carbon ± SE) of the benthic sediment collected in conjunction with nearshore invertebrate sampling in the Upper Churchill River Region for CAMPP, 2008 to 2009.

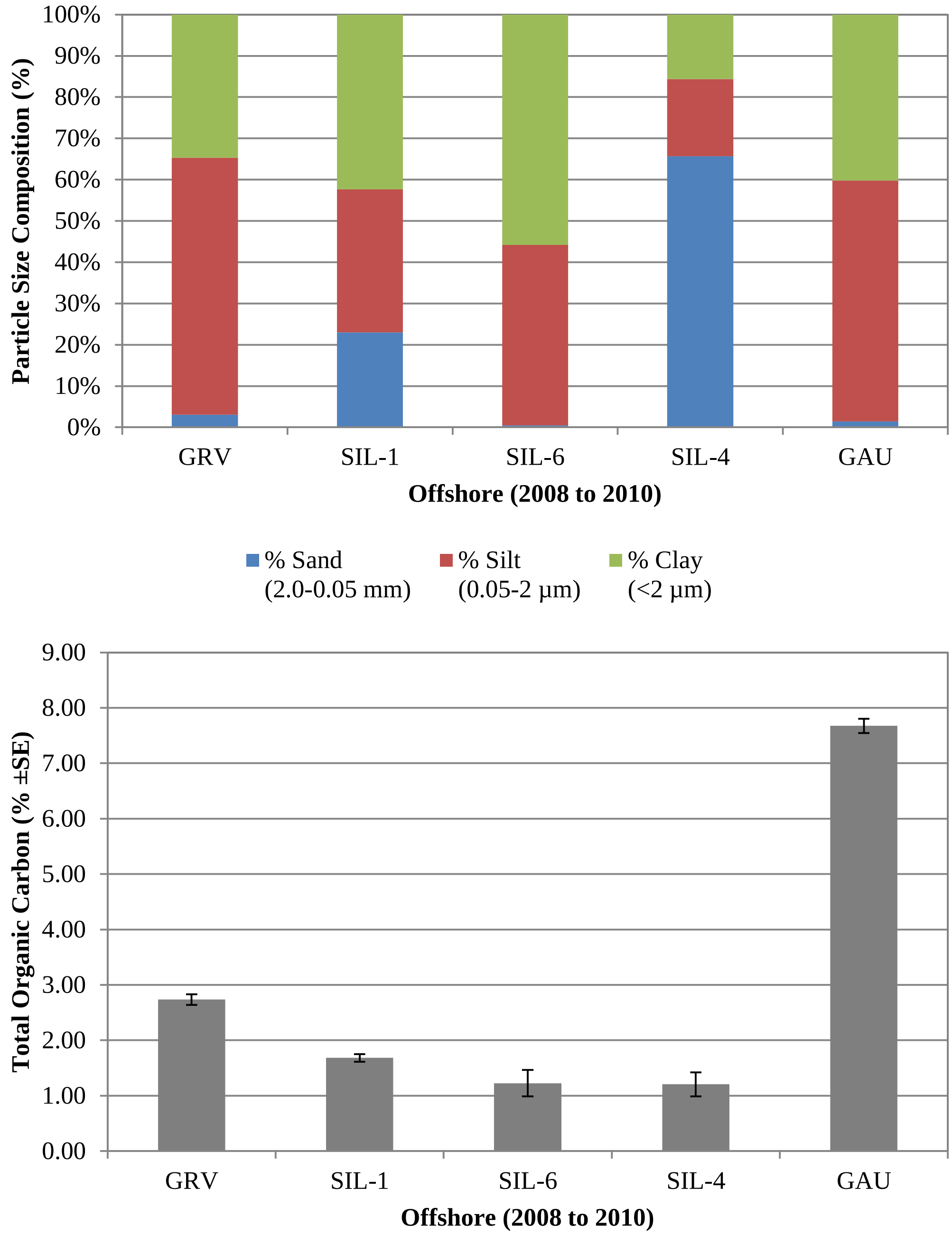


Figure 5.3.6-3. Sediment analyses (particle size composition and total organic carbon ± SE) of the benthic sediment collected in conjunction with offshore invertebrate sampling in the Upper Churchill River Region for CAMPP, 2008 to 2010.

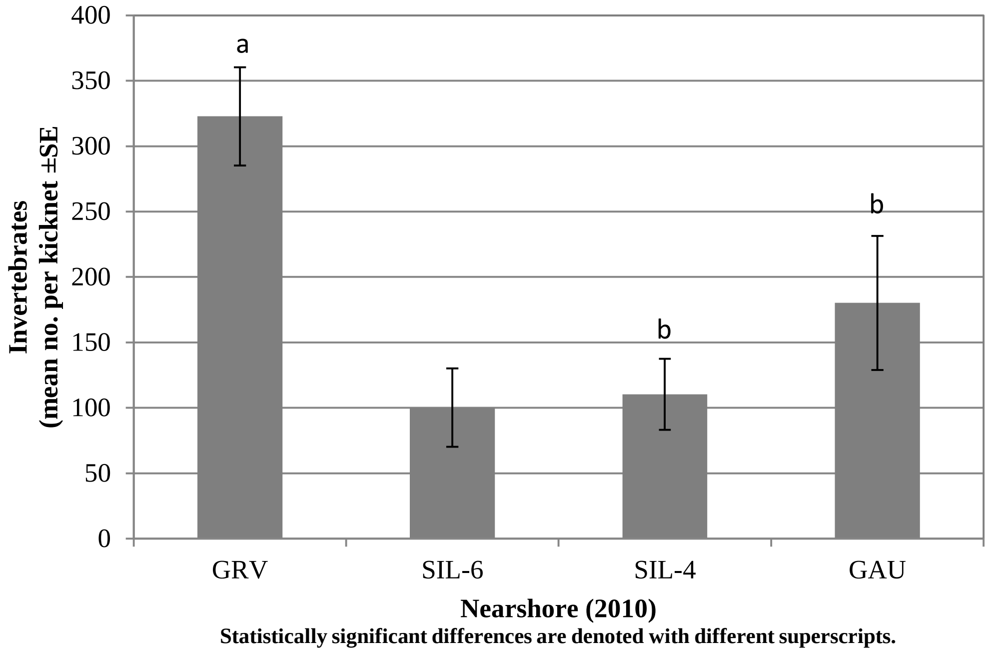


Figure 5.3.6-4. Abundances of benthic invertebrates (no. per kicknet ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2010.

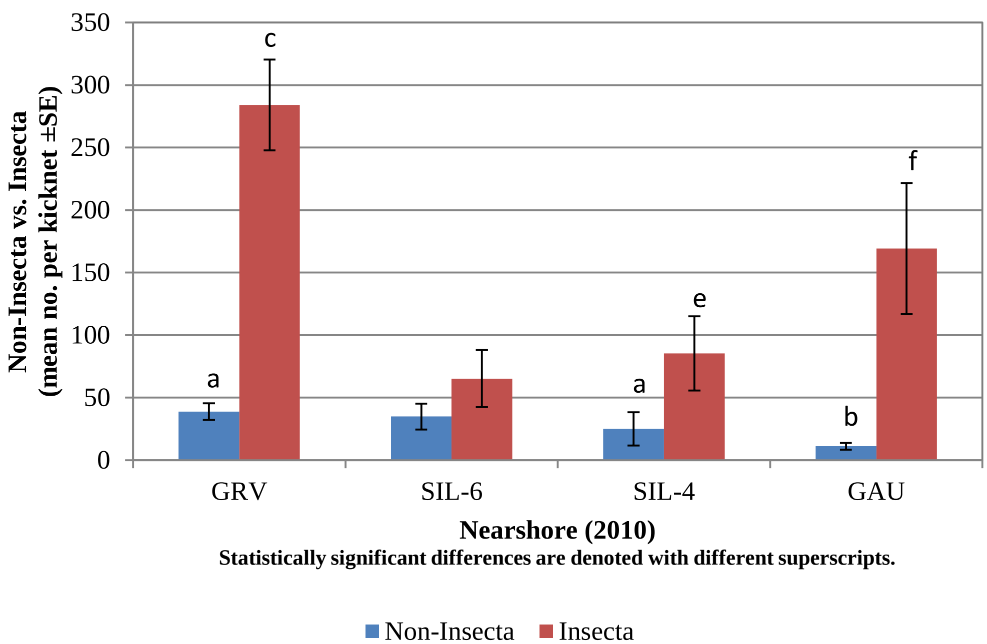


Figure 5.3.6-5. Abundances of non-insects and insects (no. per kicknet ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2010.

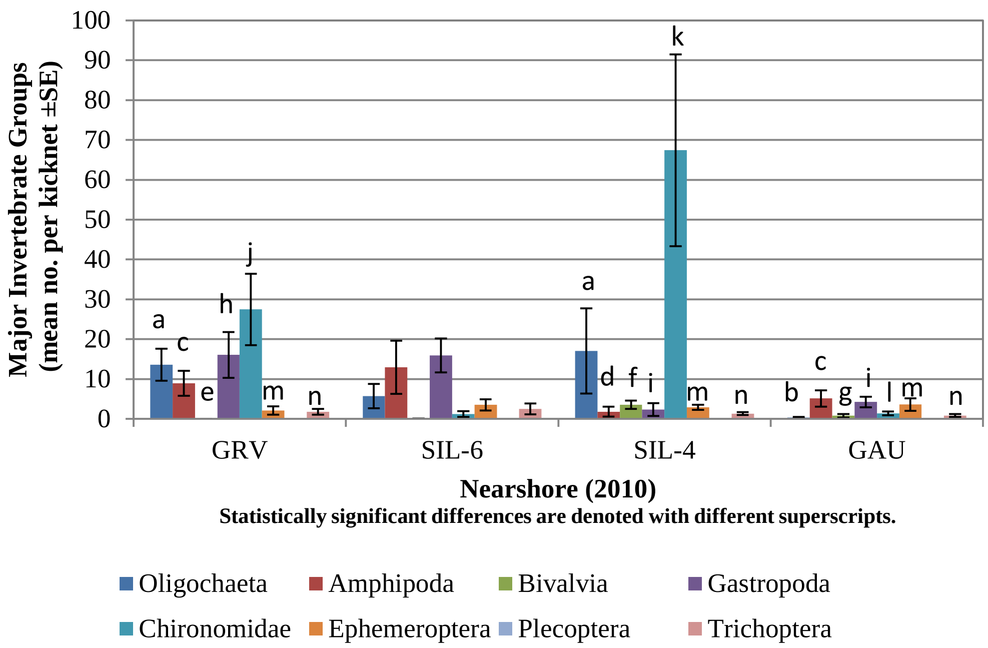


Figure 5.3.6-6. Abundances of the major invertebrate groups (no. per kicknet ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2010.

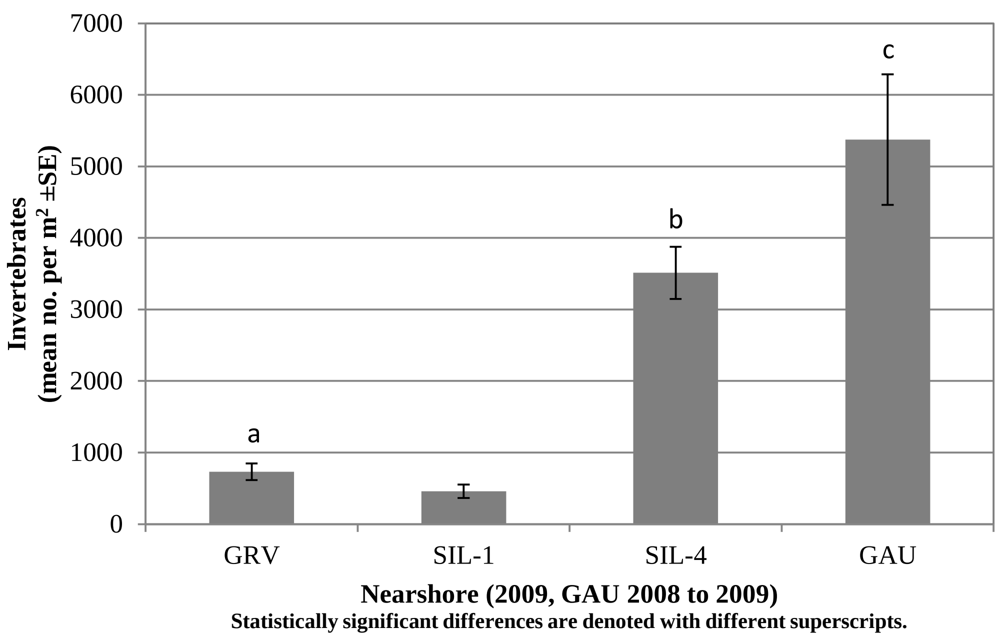


Figure 5.3.6-7. Abundances of benthic invertebrates (no. per m^2 ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2008 to 2009.

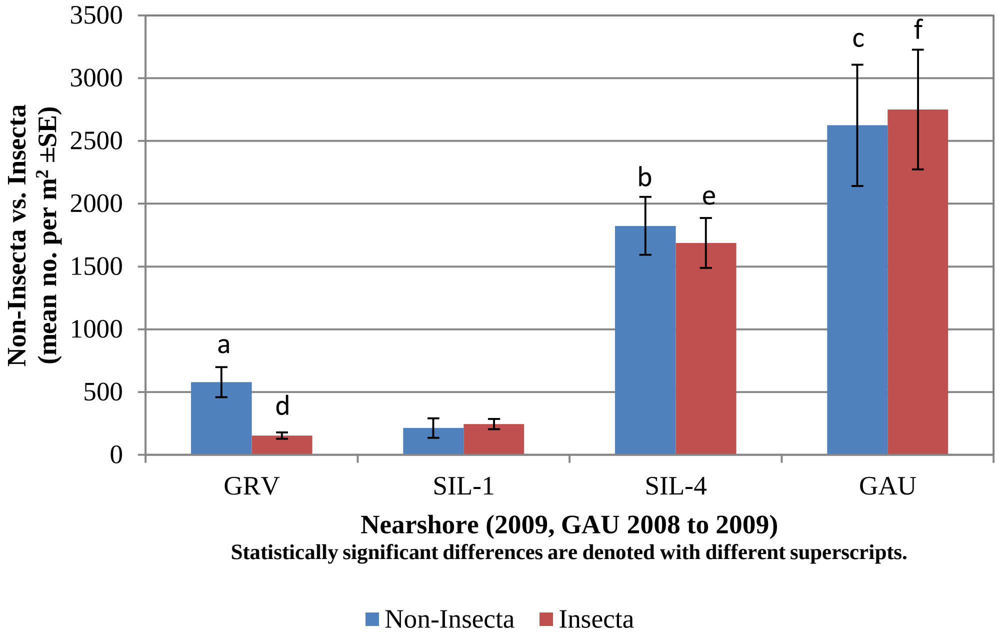


Figure 5.3.6-8. Abundances of non-insects and insects (no. per m^2 ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2008 to 2009.

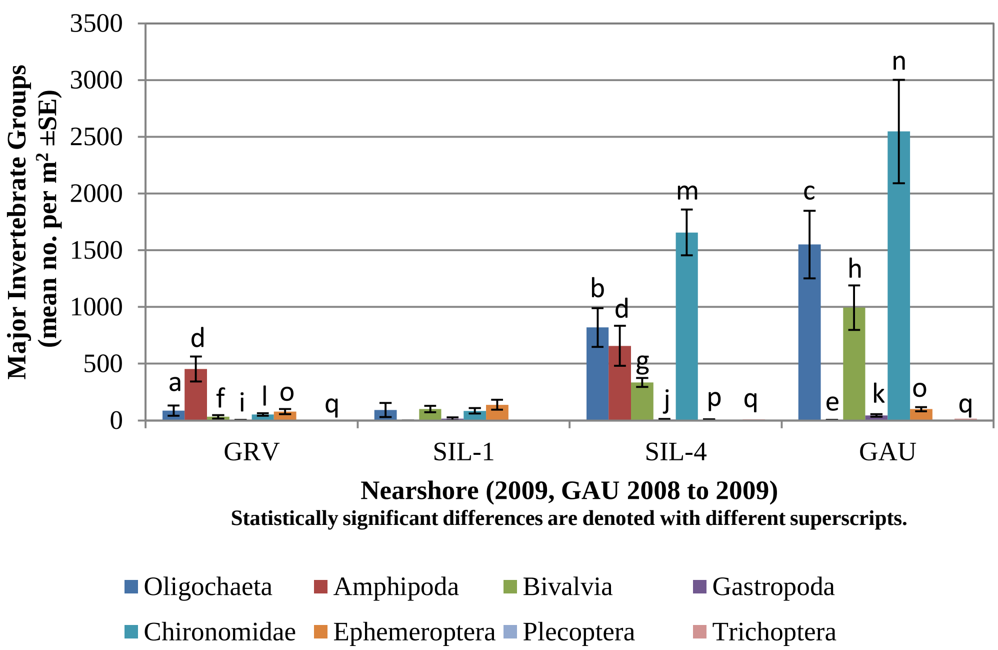


Figure 5.3.6-9. Abundances of the major invertebrate groups (no. per m^2 ± SE) collected in the nearshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2008 to 2009.

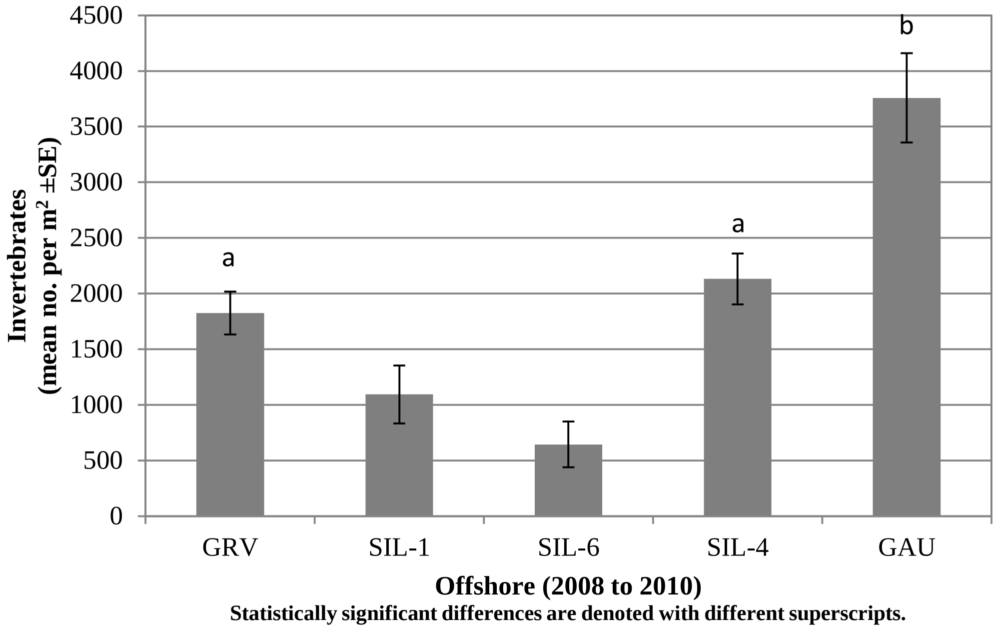


Figure 5.3.6-10. Abundances of benthic invertebrates (no. per m^2 ± SE) collected in the offshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2008 to 2010.

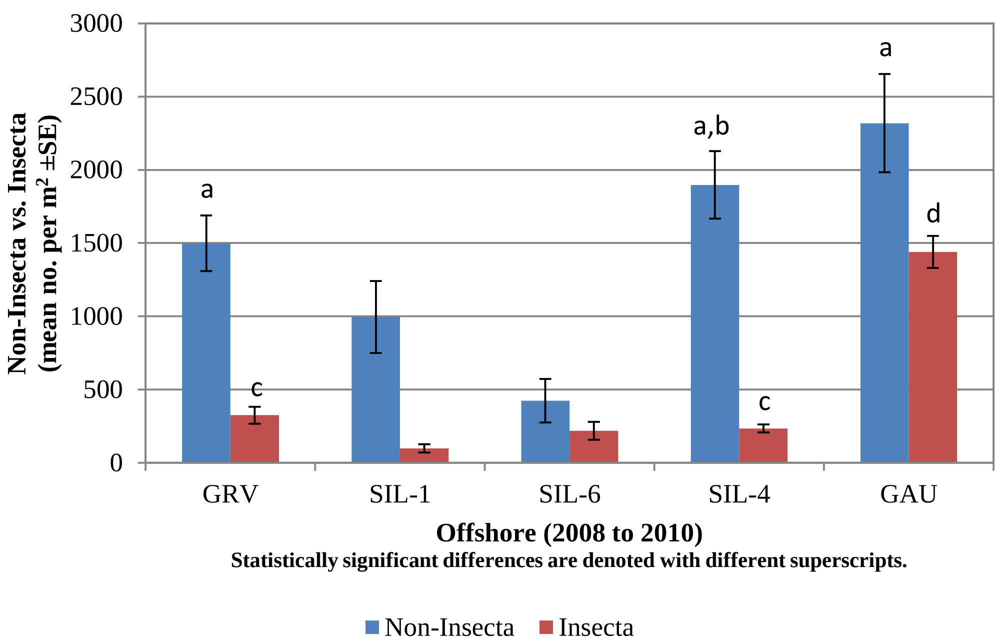


Figure 5.3.6-11. Abundances of non-insects and insects (no. per m^2 ± SE) collected in the offshore habitat of CAMPP waterbodies within the Upper Churchill River Region, 2008 to 2010.

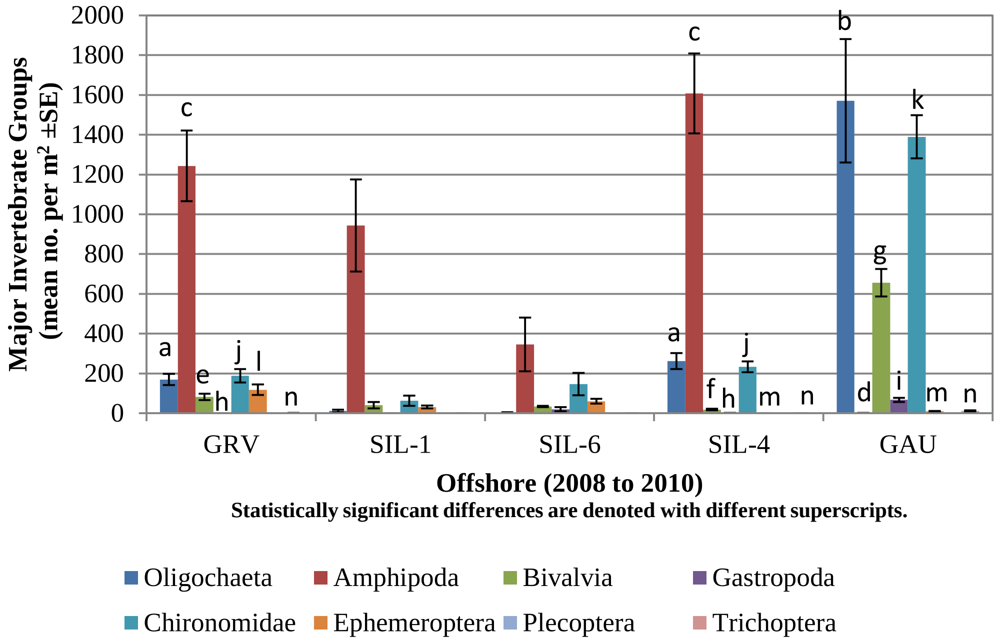


Figure 5.3.6-12. Abundances of the major invertebrate groups (no. per m^2 ± SE) collected in the offshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2008 to 2010.

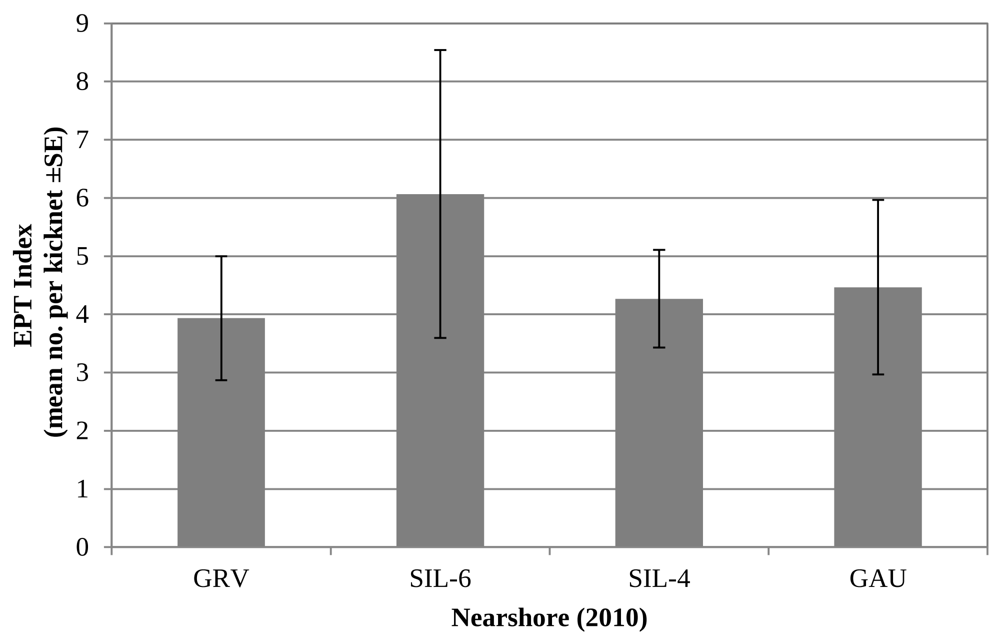


Figure 5.3.6-13. Total abundances of Ephemeroptera, Plecoptera, and Trichoptera (EPT Index) collected from nearshore kicknet samples in CAMPP waterbodies in the Upper Churchill River Region, 2010.

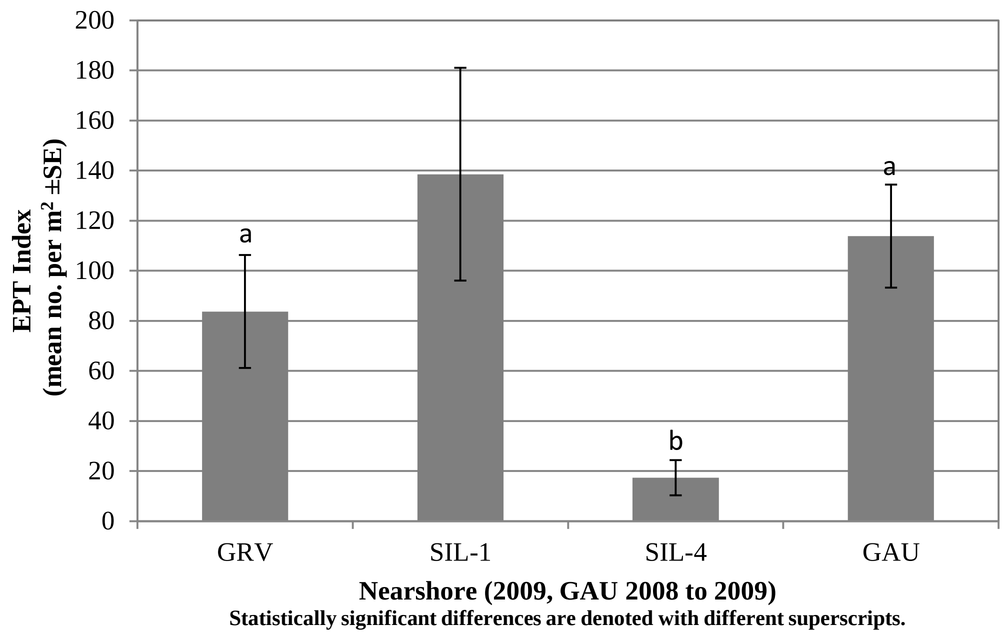


Figure 5.3.6-14. Total abundances of Ephemeroptera, Plecoptera, and Trichoptera (EPT Index) collected from nearshore grab samples in CAMPP waterbodies in the Upper Churchill River Region, 2008 to 2009.

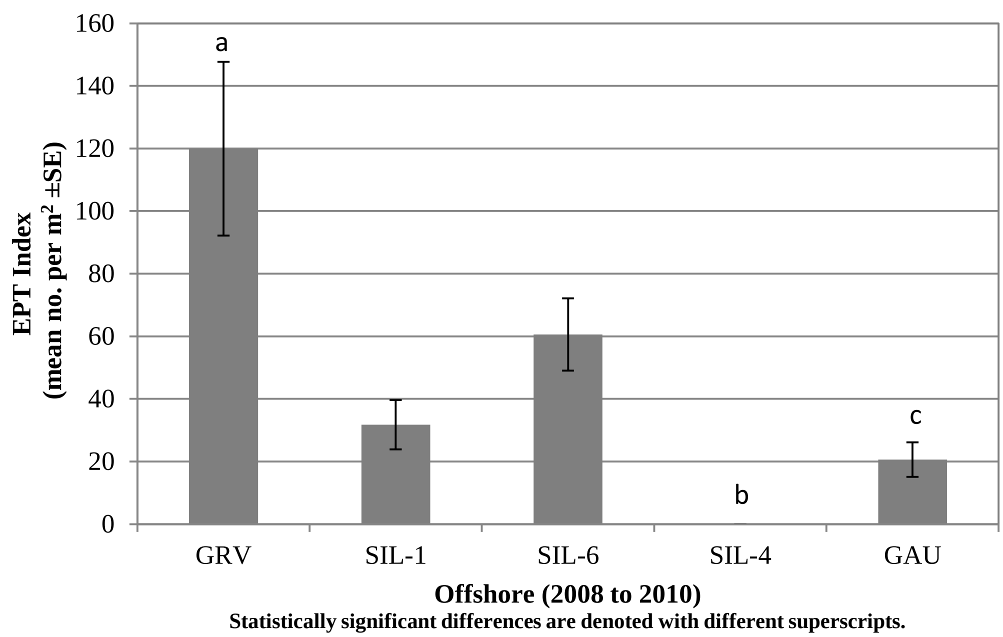


Figure 5.3.6-15. Total abundances of Ephemeroptera, Plecoptera, and Trichoptera (EPT Index) collected from offshore grab samples in CAMPP waterbodies in the Upper Churchill River Region, 2008 to 2010.

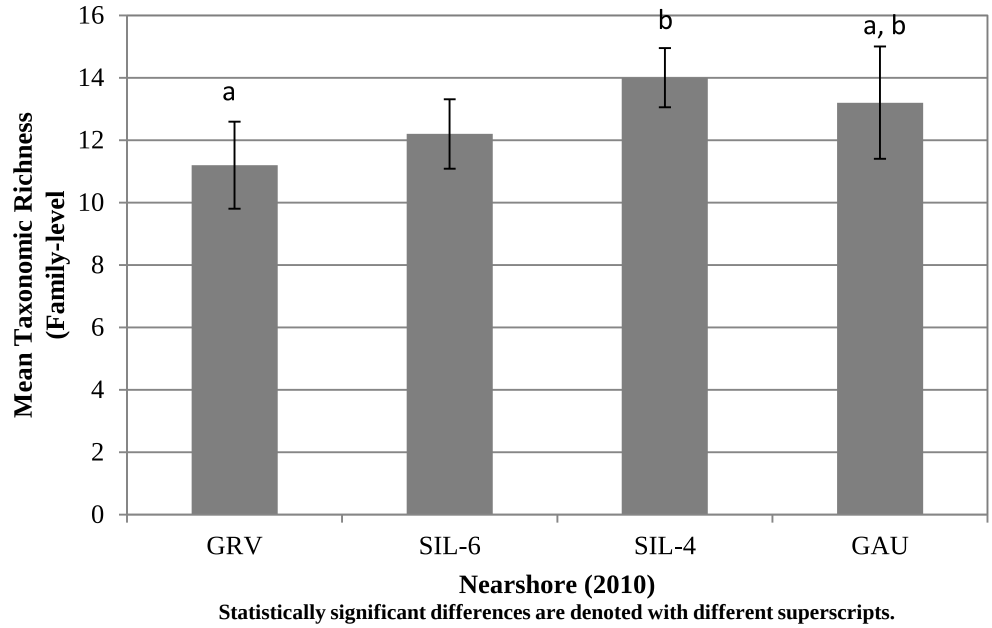


Figure 5.3.6-16. Taxa richness (mean no. of families) from benthic invertebrate kicknet samples collected in the nearshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2010.

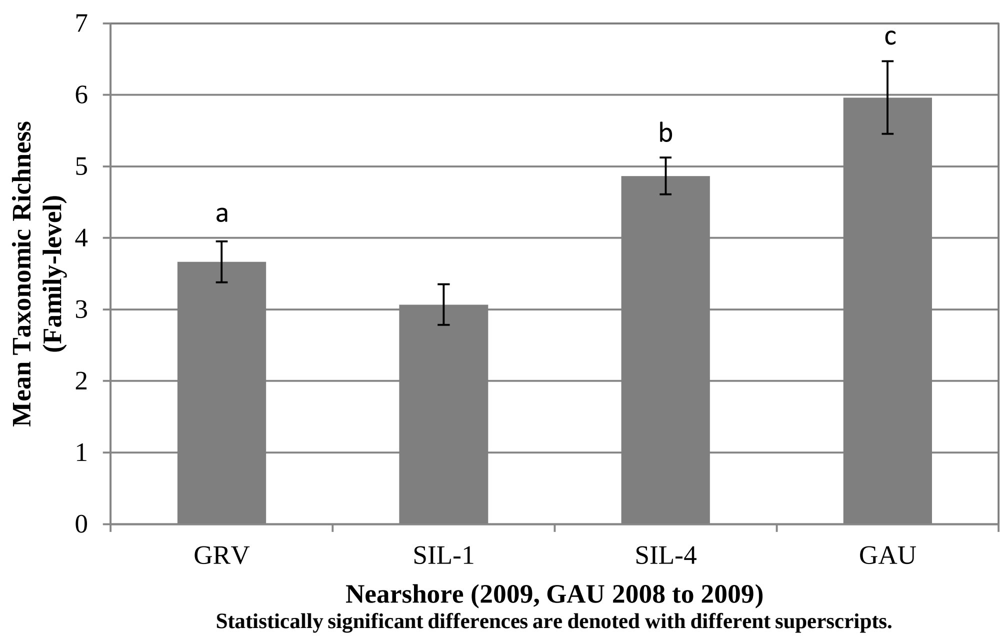


Figure 5.3.6-17. Taxa richness (mean no. of families) from benthic invertebrate grab samples collected in the nearshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2008 to 2009.

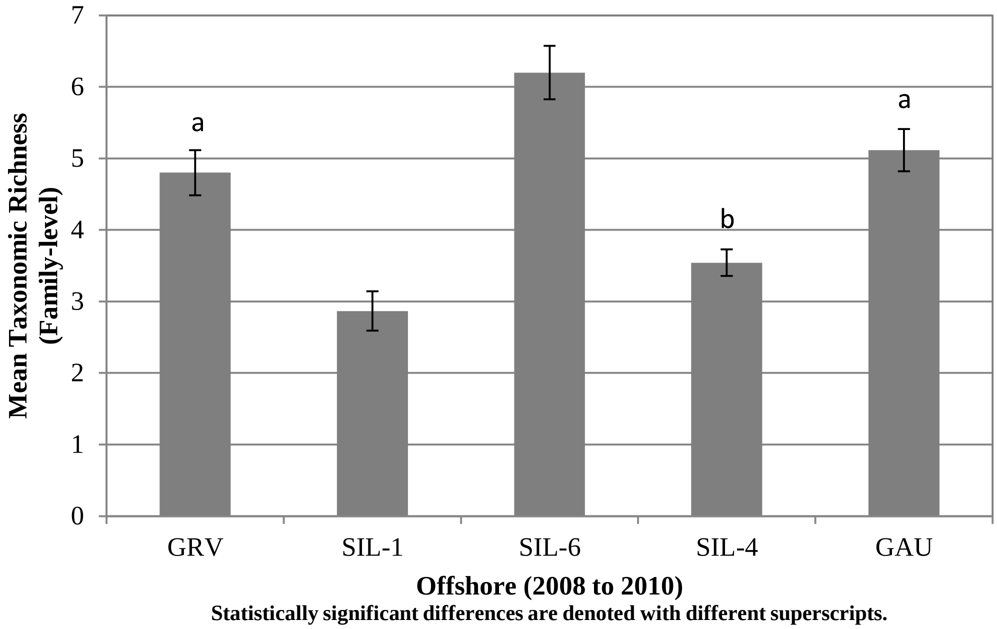


Figure 5.3.6-18. Taxa richness (mean no. of families) from benthic invertebrate grab samples collected in the offshore habitat of CAMPP waterbodies in the Upper Churchill River Region, 2009 to 2010.

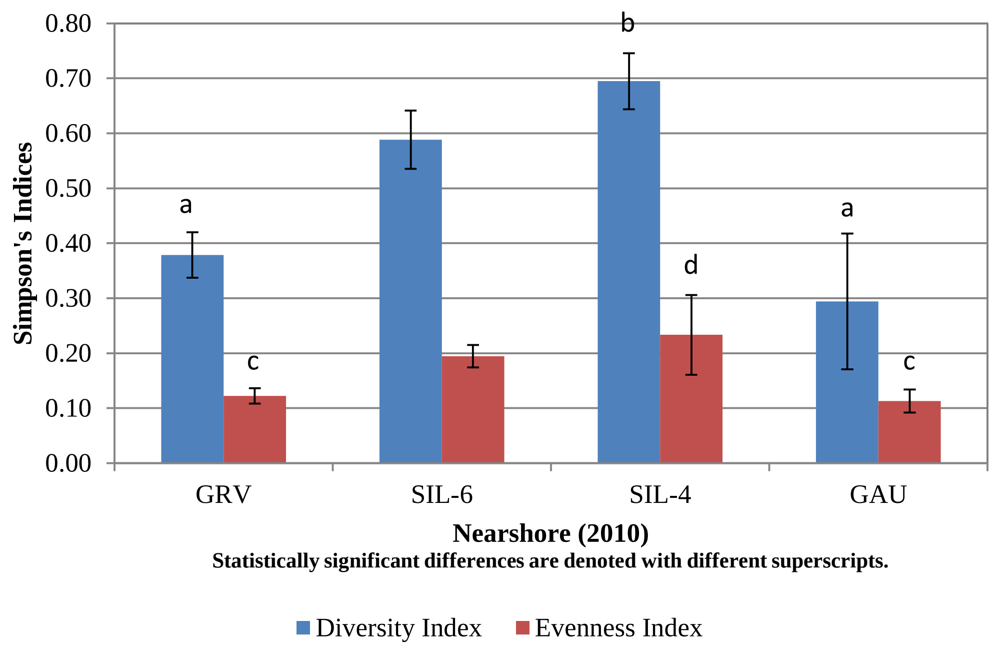


Figure 5.3.6-19. Diversity and evenness (Simpson's) indices calculated from nearshore kicknet samples of CAMPP waterbodies in the Upper Churchill River Region, 2010.

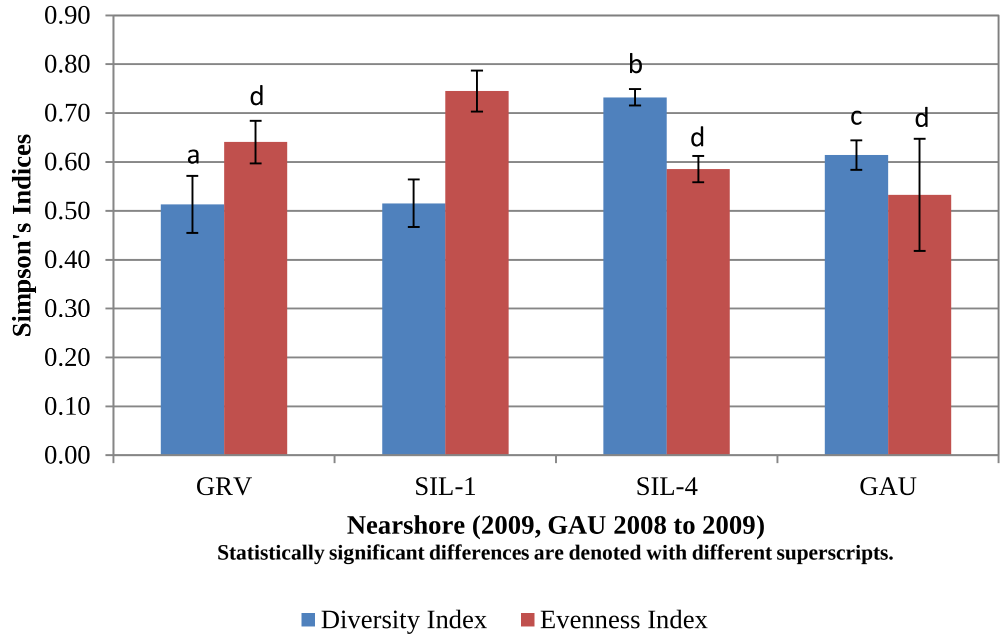


Figure 5.3.6-20. Diversity and evenness (Simpson's) indices calculated from nearshore grab samples of CAMPP waterbodies in the Upper Churchill River Region, 2008 to 2009.

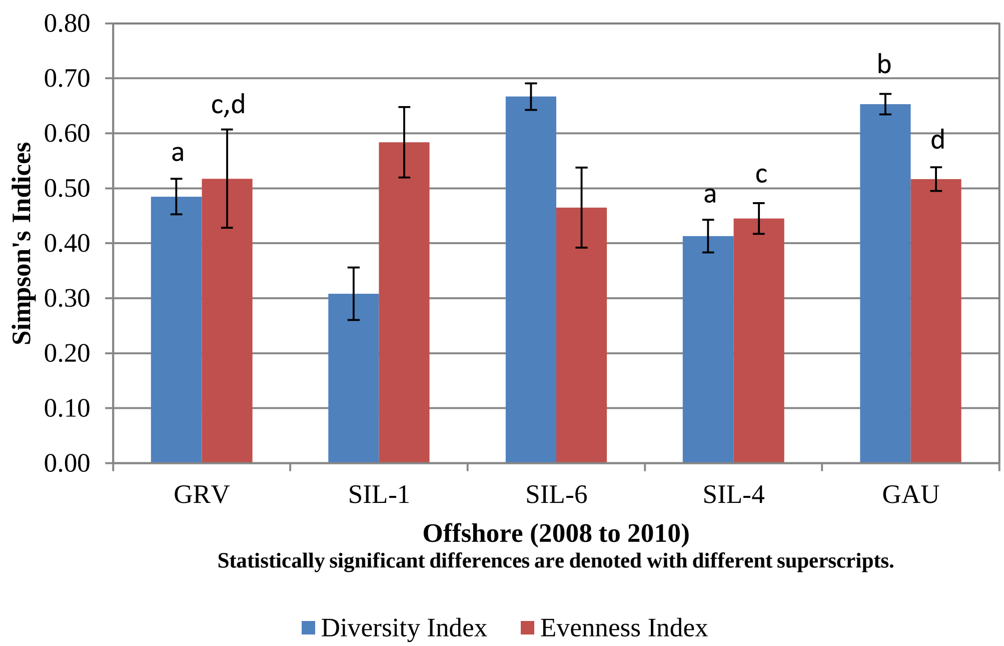


Figure 5.3.6-21. Diversity and evenness (Simpson's) indices calculated from offshore grab samples of CAMPP waterbodies within the Upper Churchill River Region, 2008 to 2010.

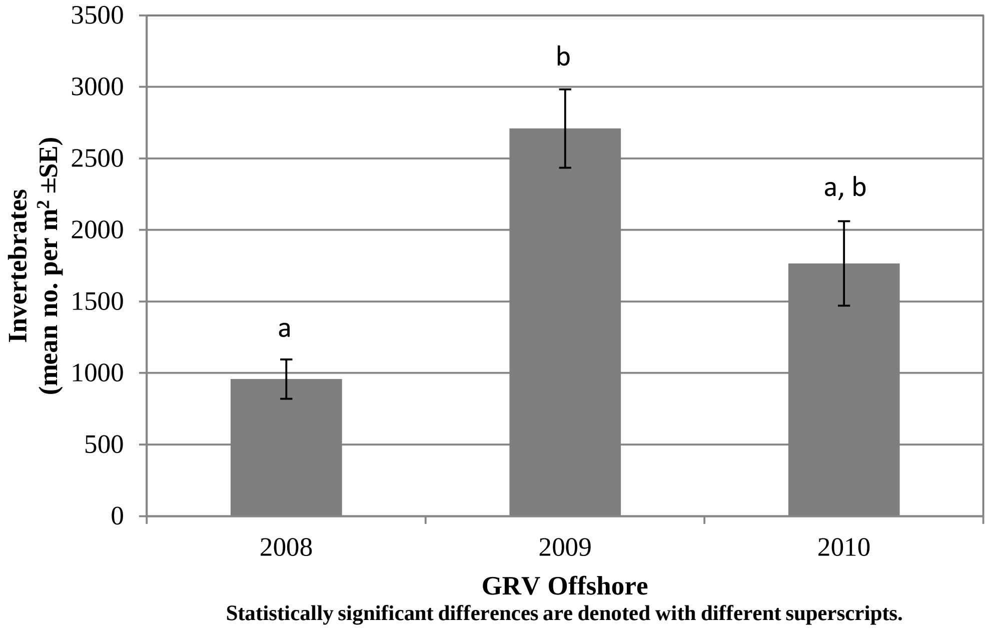


Figure 5.3.6-22. Temporal comparison of benthic invertebrate abundances (no. per $m^2 \pm$ SE) collected in the offshore habitat of Granville Lake, 2008 to 2010.

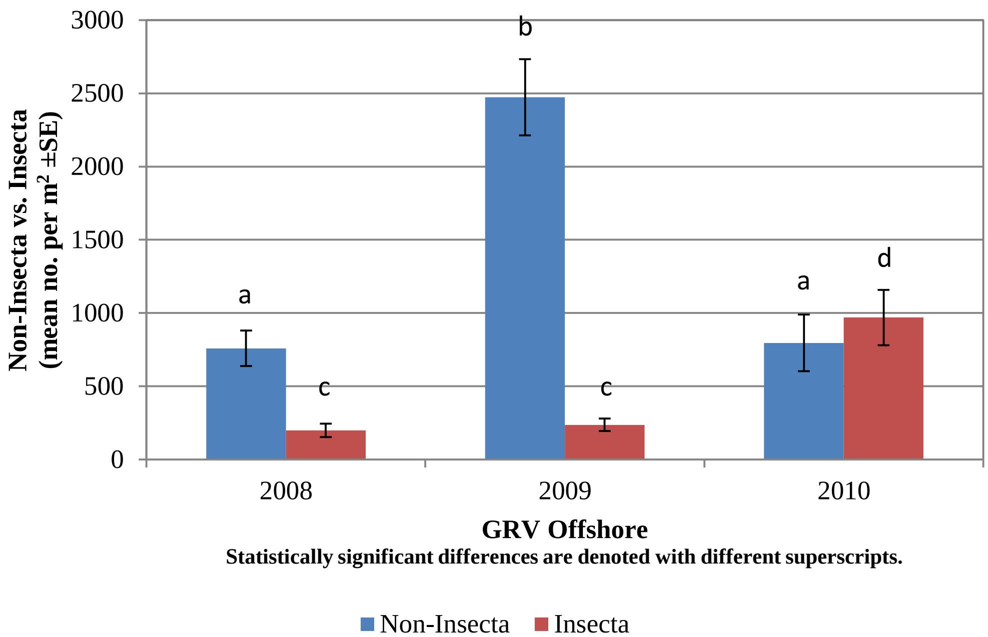


Figure 5.3.6-23. Temporal comparison of non-insect and insect abundances (no. per $m^2 \pm$ SE) collected in the offshore habitat of Granville Lake, 2008 to 2010.

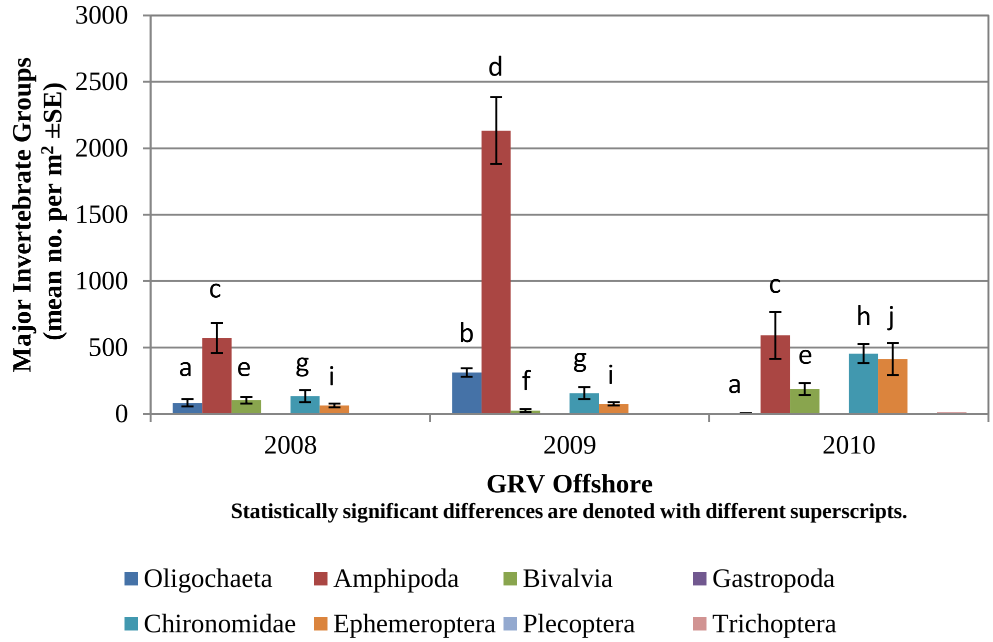


Figure 5.3.6-24. Temporal comparison of major invertebrate group abundances (no. per m^2 ± SE) collected in the offshore habitat of Granville Lake, 2008 to 2010.

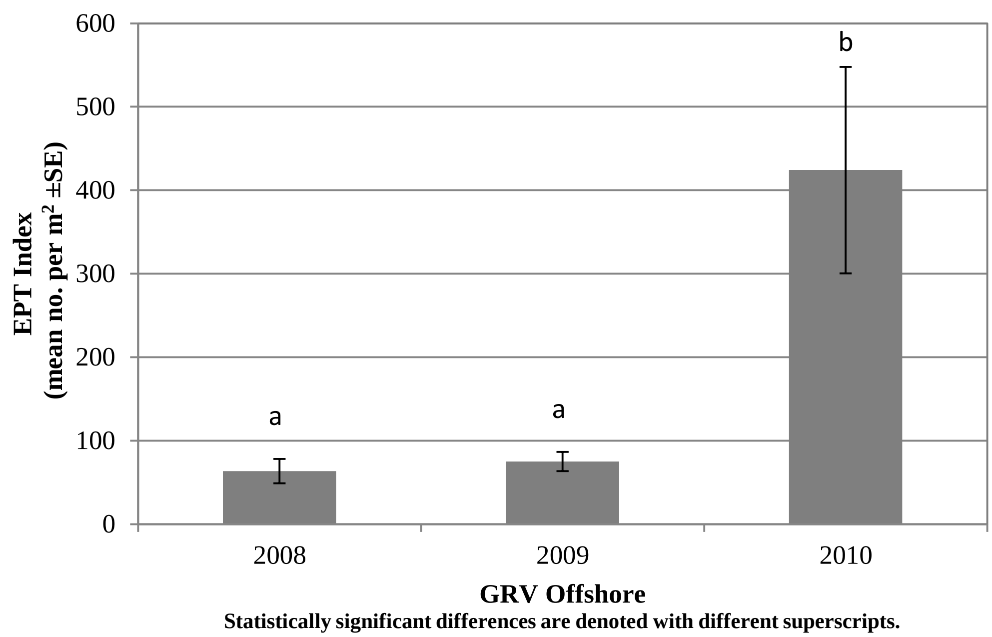


Figure 5.3.6-25. Temporal comparison of Ephemeroptera, Plecoptera, and Trichoptera abundances (EPT Index) of offshore habitat of Granville Lake, 2008 to 2010.

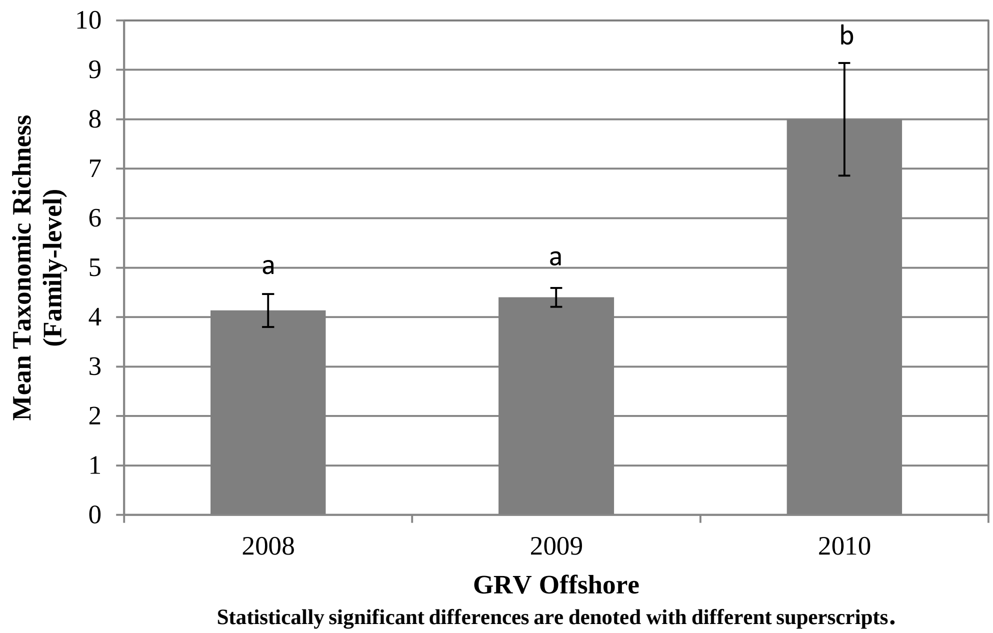


Figure 5.3.6-26. Temporal comparison of benthic invertebrate taxa richness (mean no. of families) of offshore habitat of Granville Lake, 2008 to 2010.

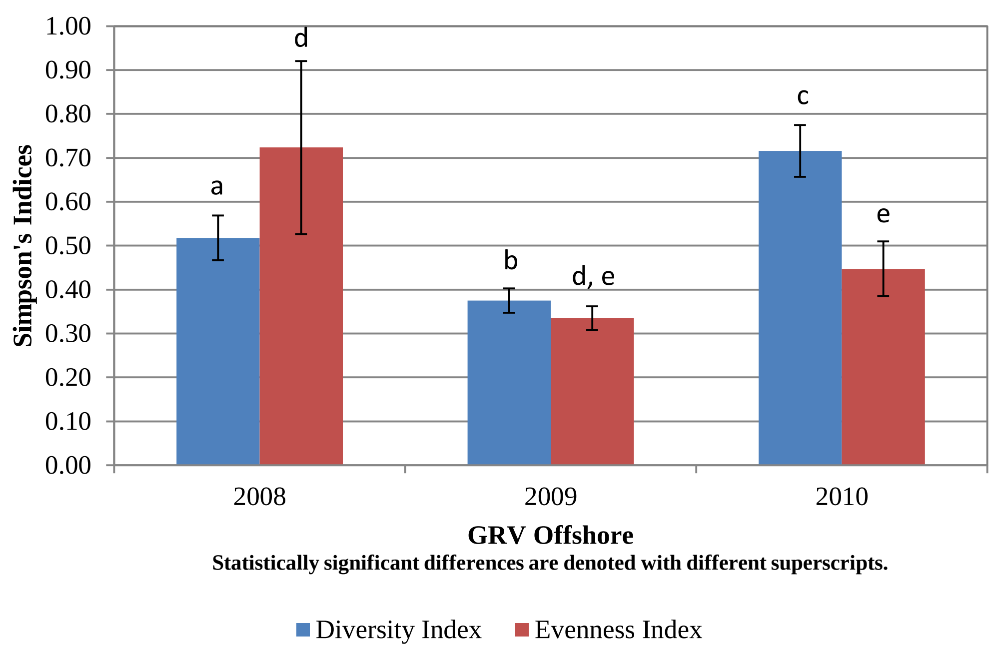


Figure 5.3.6-27. Temporal comparison of diversity and evenness (Simpson's) indices of offshore habitat of Granville Lake, 2008 to 2010.

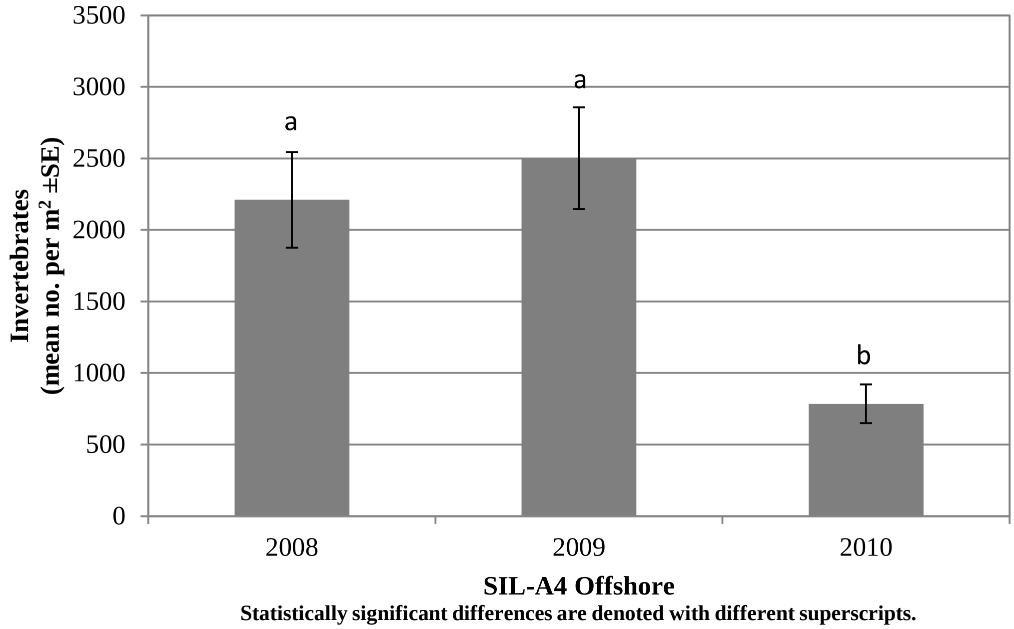


Figure 5.3.6-28. Temporal comparison of benthic invertebrate abundances (no. per m^2 ± SE) collected in the offshore habitat of Southern Indian Lake-Area 4, 2008 to 2010.

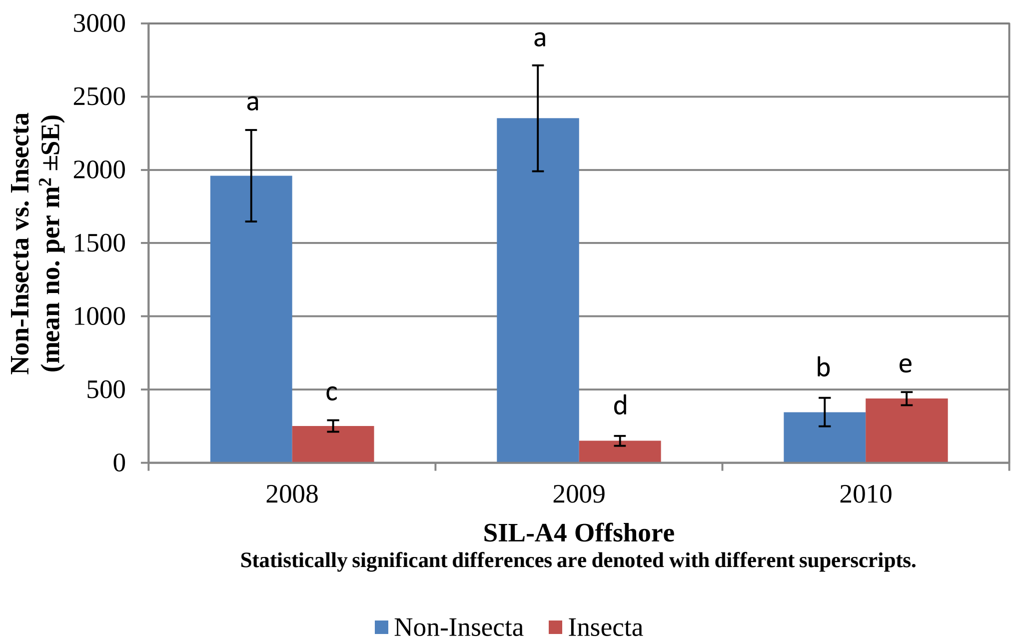


Figure 5.3.6-29. Temporal comparison of non-insect and insect abundances (no. per m^2 ± SE) collected in the offshore habitat of Southern Indian Lake-Area 4, 2008 to 2010.

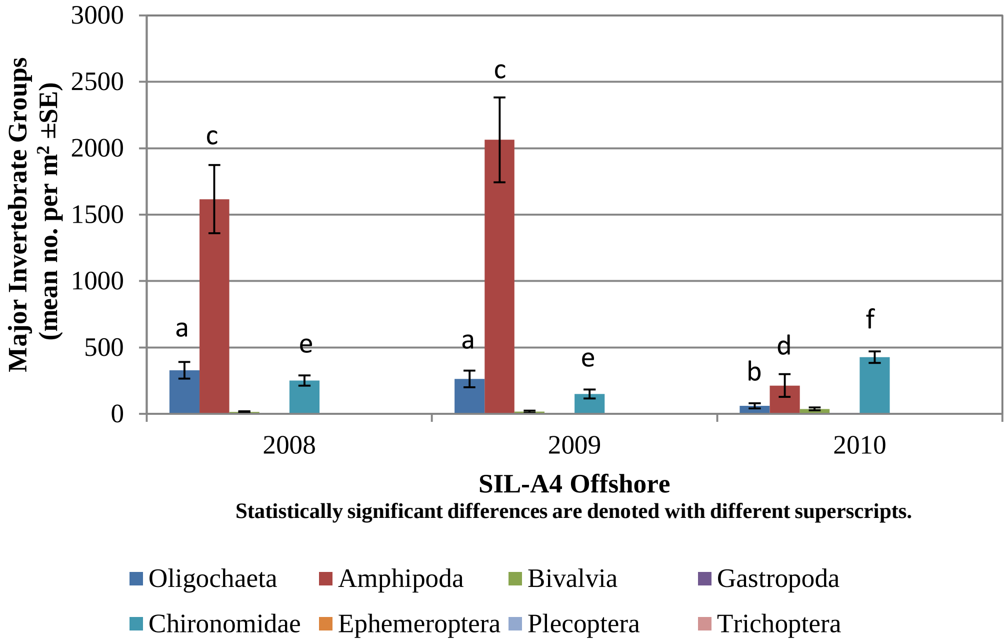


Figure 5.3.6-30. Temporal comparison of major invertebrate group abundances (no. per m^2 ± SE) collected in the offshore habitat of Southern Indian Lake-Area 4, 2008 to 2010.

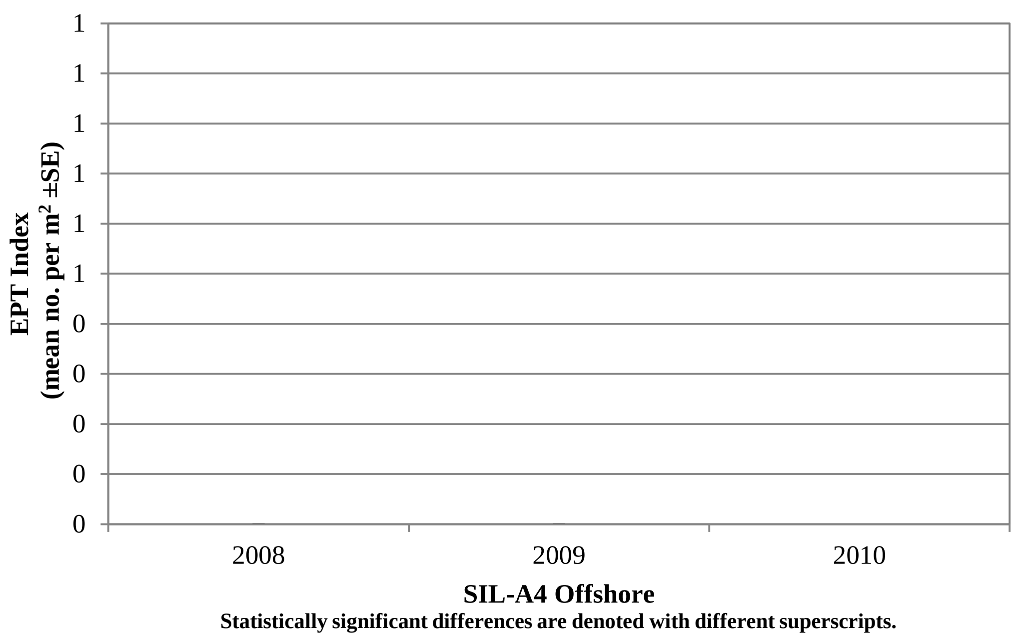


Figure 5.3.6-31. Temporal comparison of Ephemeroptera, Plecoptera, and Trichoptera abundances (EPT Index) of offshore grab samples from Southern Indian Lake-Area 4, 2008 to 2010.

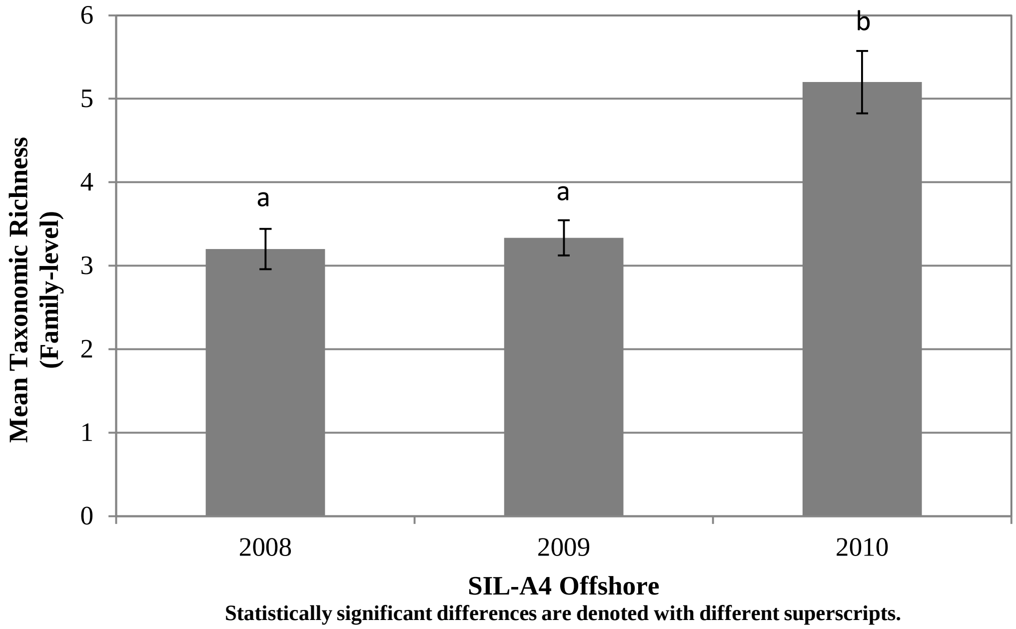


Figure 5.3.6-32. Temporal comparison of benthic invertebrate taxa richness (mean no. of families) of offshore grab samples from Southern Indian Lake-Area 4, 2008 to 2009.

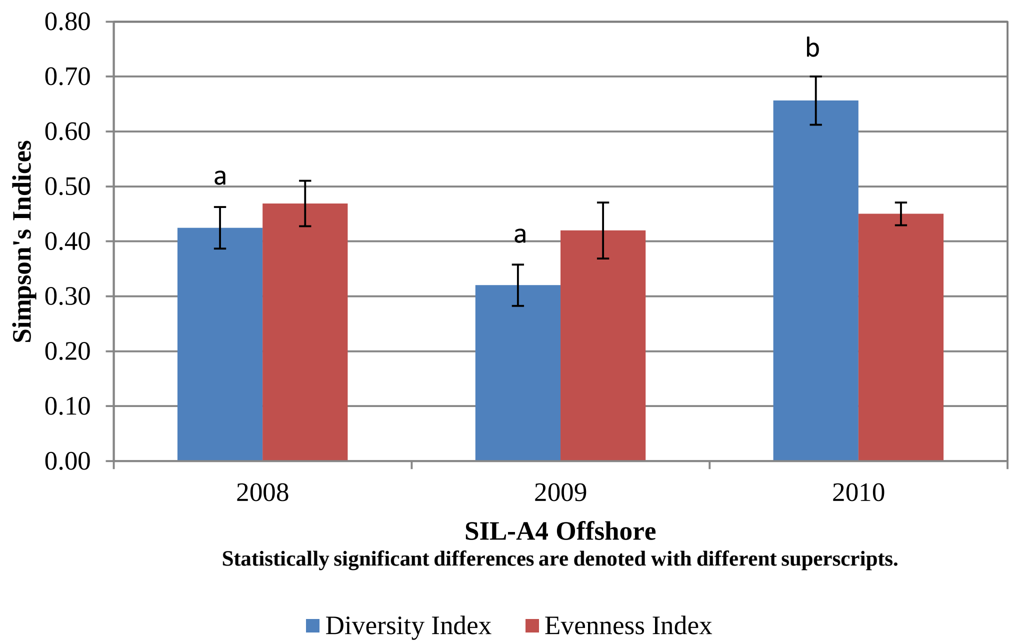


Figure 5.3.6-33. Temporal comparison of diversity and evenness (Simpson's) indices of offshore grab samples from Southern Indian Lake-Area 4, 2008 to 2010.

5.3.7 Fish Communities

5.3.7.1 Overview

The following provides an overview of fish communities present in five waterbodies within the Upper Churchill River Region sampled as part of the CAMPP program conducted from 2008 to 2010. Waterbodies sampled annually included one on-system waterbody (Southern Indian Lake - Area 4), and two off-system waterbodies (Gauer and Granvile lakes). In addition, the fish community of Southern Indian Lake - Area 1 and Southern Indian Lake - Area 6 (rotational on-system waterbodies) were sampled in 2009 and 2010, respectively.

Gill netting, using both standard gang and small mesh gill nets, was conducted at a pre-determined number of sites in each waterbody and these were typically consistently fished in each of the years of study. Individual fish from each site were enumerated by species and mesh size. For selected species (i.e., Northern Pike [*Esox lucius*], Lake Whitefish [*Coregonus clupeaformis*], and Walleye [*Sander vitreus*]), individual metrics were collected from all fish captured in the standard gang index gill nets. Selected metrics were also collected from White Sucker [*Catostomus commersoni*]. No individual metrics were collected from fish captured in the small mesh index gill net gangs. Metrics collected included length, weight, occurrence of deformities, erosion, lesions and tumours (DELTs), and ageing structures. The remaining species from the standard gang index gillnet catch were counted and bulk weighed to the nearest 25 g by species and mesh size. Fish from the small mesh index gill nets were not separated by mesh size, but were separated on the basis of species, counted and bulk weighed to the nearest 25 g (large-bodied species) or 1 g (small-bodied species).

A total of 12 fish species were present within Southern Indian Lake – Areas 1, 4 and 6. Thirteen species were captured in the off-system waterbody of Gauer Lake and 14 were captured in Granvile Lake, the other off-system waterbody. Overall, the large-bodied fish community of the Upper Churchill River Region was found to be dominated by White Sucker (Granville and Gauer lakes) or Longnose Sucker (*Catostomus catostomus*) (Southern Indian Lake – Area 4), Cisco (*Coregonus artedi*), Lake Whitefish, Sauger (*Sander canadensis*), and Northern Pike. Walleye were also common in Granville and Gauer lakes while Sauger were absent from Gauer Lake. Within Southern Indian Lake, Area 6 was found to be somewhat dissimilar to Areas 1 and 4 with fewer Lake Whitefish, Longnose Sucker, and Burbot (*Lota lota*). Area 1 and Area 6 differed from Area 4 in that they both had more White Sucker and Sauger in the catch. Yellow Perch (*Perca flavescens*), Spottail Shiner (*Notropis hudsonius*), Emerald Shiner (*Notropis atherinoides*), and Troutperch (*Percopsis omiscomaycus*) generally dominated the small-bodied fish community in both Granville and Gauer lakes. These species were typically not very abundant in any of the three sampled areas of Southern Indian Lake.

Granville Lake was found to have a similar standard gang index gillnet mean overall total CPUE to that in Gauer Lake, the other off-system reference waterbody. In Southern Indian Lake, mean total CPUE values in Areas 1 and 6 were approximately one-half of that in Granville Lake, while Area 4 showed a somewhat higher mean overall total CPUE (largely a result of a relatively high CPUE value in 2008), more closely approximating that in Granville Lake.

Year-class strength for species of management interest, while showing some patterns, was not consistent among all waterbodies in the region. In general, Northern Pike data showed good representation across several year classes with no weak or exceptionally strong year classes. In Granville Lake, strong year-classes of Lake Whitefish appear to have been produced in 2002 and 2005-2007 while data for Gauer Lake suggested few weak or exceptionally strong year-classes. In Southern Indian Lake, 2003 and 2004 cohorts appeared to be underrepresented in the catch from Area 1, while Area 6 data showed a strong cohort in 2006 and few older fish in the catch, and the Area 4 population appears to be dominated by very strong 1999 and, to a lesser extent, 2000 cohorts with few younger fish present in the catch. For Walleye, data from Gauer Lake suggested few weak or strong cohorts, while data from Granville Lake showed good year classes in each year from 2001 to 2006 except 2004 which appears to be a missing or very weak cohort. Walleye were not captured in sufficient numbers in Southern Indian Lake to assess year-class strength.

The overall incidence rate for deformities, erosion, lesions and tumours in species of management interest was very low for all on-system waterbodies (0.0 – 0.4%) and was slightly higher for Gauer Lake at 1.0%.

Temporal CPUE comparisons were undertaken for the three waterbodies sampled in each of 2008, 2009 and 2010 in order to provide a preliminary assessment of temporal variability. In Granville Lake and Gauer Lake, standard gang index gillnet mean total CPUE varied little year to year while that for Southern Indian Lake - Area 4 declined by approximately one-half from 2008 to 2010. As additional data are acquired, more formal trend analysis will be undertaken to evaluate any potential long-term changes.

Southern Indian Lake - Areas 1 and 6 and Gauer Lake had the highest Index of Biotic Integrity scores, suggesting that these waterbodies had the best overall fish community condition. IBI scores for Southern Indian Lake - Area 4 showed considerable variability primarily due to variation in CPUE values, with the score for 2008 being the single highest score for the region and the scores for 2009 and 2010 being among the lowest. On average, Granville Lake had the lowest overall IBI score for the region.

5.3.7.2 Gill netting

Granville Lake was sampled with standard gang index gill nets at 12 sites in each of mid-August 2008, late July 2009, and late July and early September 2010 (Table 5.3.7-1, Figure 5.3.7-1). Although 12 sites were fished in any given year, a total of 14 sites were used in at least one of the three years. Nine sites were sampled in all three years; other sites were sampled in one or two years only. Southern Indian Lake was sampled in a total of three basins between 2008 and 2010. Area 4 was sampled annually, while Area 1 and Area 6 were sampled on a rotational basis (Table 5.3.7-1, Figures 5.3.7-2, 5.3.7-3 and 5.3.7-4). Area 4 was sampled in late July 2008 (25 sites), early August and mid-September 2009 (24 sites), and late September 2010 (21 sites). Over the three years, a total of 27 sites were fished in at least one of the three years. Eighteen sites were sampled in all three years; other sites were sampled in one or two years only. Area 1 was sampled in late July 2009, while Area 6 was sampled in early August 2010. Twelve sites were sampled in both areas. Nine sites were sampled in Gauer Lake in late July of 2008 and 2009, and mid-July of 2010 (Table 5.3.7-1, Figure 5.3.7-5). All nine sites were sampled in all three years.

Small mesh index gill nets were attached to the smallest mesh end of the standard gang gill net set in Granville Lake at three of 12 sites in 2008 and 2010, and four of 12 sites in 2009 (Table 5.3.7-1, Figure 5.3.7-1). Considerable variation in small mesh net site locations occurred between years with no sites common to all three years of sampling. Small mesh index gill nets were set at one site in Southern Indian Lake – Area 1 (Figure 5.3.7-2) and at four sites in Southern Indian Lake – Area 6 (Figure 5.3.7-3). In Southern Indian Lake - Area 4, small mesh nets were set at six of 25 sites in 2008, at three of 24 sites in 2009, and at five of 21 sites in 2010 (Table 5.3.7-1, Figure 5.3.6-4). As was the case with Granville Lake, considerable variation in small mesh set locations occurred among years in Southern Indian Lake - Area 4 with no small mesh sites common to all three years of sampling. In Gauer Lake, all three small mesh sampling sites were consistently sampled in each of 2008, 2009 and 2010 (Table 5.3.7-1, Figure 5.3.7-5).

5.3.7.3 Species Composition

A comprehensive list of all fish species captured, including common and scientific names, family, and identification code, for all Upper Churchill River Region waterbodies is provided in Table 5.3.7-2.

Granville Lake

Over all years combined, a total of 2,768 fish (2,421,465 g) representing 10 species were captured in standard gang index gill nets set in Granville Lake (Tables 5.3.7-3 and 5.3.7-4). The number of species captured ranged from a low of nine in 2008 to a high of 10 species in both 2009 and 2010. For all years combined, the most common species captured in standard gang index gill nets was White Sucker (mean relative abundance = 61.1%) (Table 5.3.7-3; Figure 5.3.7-6). White Sucker also accounted for the highest proportion of total biomass (72.2%), (Table 5.3.7-4).

For the small mesh index gill nets for all years of sampling, a total of 745 fish (31,983 g) representing 15 species were captured (Tables 5.3.7-5 and 5.3.7-6). The number of species captured ranged from a low of seven in 2008 to a high of 12 in 2010. Sauger was the most common species captured overall (mean relative abundance = 19.1%) (Table 5.3.7-5 and Figure 5.3.7-6). For small-bodied fish species from the small mesh index gillnet catch, Yellow Perch accounted for the highest proportion of biomass (6.4%) (Table 5.3.7-6).

Southern Indian Lake - Area 1

In 2009, a total of 308 fish (238,780 g) representing nine species were captured in standard gang index gill nets set in Southern Indian Lake - Area 1 (Tables 5.3.7-3 and 5.3.7-4). The most common species captured in standard gang index gill nets was Lake Whitefish (relative abundance = 20.5%) (Table 5.3.7-3 and Figure 5.3.7-7). Lake Whitefish also accounted for the highest proportion of total biomass (26.0%), followed by Longnose Sucker (20.2%) and Northern Pike (17.9%) (Table 5.3.7-4).

Three fish (212 g), representing three species (Lake Whitefish, Troutperch, and Slimy Sculpin [*Cottus cognatus*]) were captured in the one small mesh index gill net that was set (Tables 5.3.7-5 and 5.3.7-6, Figure 5.3.7-7).

Southern Indian Lake - Area 6

In 2010, a total of 423 fish (201,140 g) representing nine species were captured in standard gang index gill nets set in Southern Indian Lake - Area 6 (Tables 5.3.7-3 and 5.3.7-4). The most common species captured in standard gang index gill nets were Sauger (relative abundance = 36.4%) (Table 5.3.7-3 and Figure 5.3.7-8). Cisco accounted for the highest proportion of total biomass (22.8%), followed by White Sucker (20.1%) (Table 5.3.7-4).

For the small mesh index gill nets, a total of 179 fish (16,110 g) representing eight species were captured (Tables 5.3.7-5 and 5.3.7-6). Sauger was the most common species (relative abundance

= 48.0%) (Table 5.3.7-5 and Figure 5.3.7-8). For small-bodied fish species from the small mesh index gillnet catch, Troutperch accounted for the highest proportion of total biomass (1.4%) (Table 5.3.7-6).

Southern Indian Lake - Area 4

Over all years combined, a total of 3,824 fish (2,494,374 g) representing eight species were captured in standard gang index gill nets set in Southern Indian Lake - Area 4 (Tables 5.3.7-3 and 5.3.7-4). The number of species captured ranged from a low of seven in both 2008 and 2009 to a high of eight species in 2010. For all years combined, the most common species captured in standard gang index gill nets was Longnose Sucker (mean relative abundance = 29.1%) followed by Lake Whitefish (27.9%) (Table 5.3.7-3 and Figure 5.3.7-9). Longnose Sucker accounted for the highest proportion of total biomass (34.8%), followed by Lake Whitefish (22.5%) (Table 5.3.7-4).

For the small mesh index gill nets for all years of sampling, a total of 120 fish (13,971 g) representing 10 species were captured (Tables 5.3.7-5 and 5.3.7-6). The number of species captured ranged from a low of five in 2009 to a high of seven species in both 2008 and 2010. Cisco was the most common species captured overall (mean relative abundance = 66.7%) (Table 5.3.7-5 and Figure 5.3.7-9). For small-bodied fish species from the small mesh index gillnet catch, Troutperch accounted for the highest proportion of total biomass (0.9%) (Table 5.3.7-6).

Gauer Lake

Over all years combined, a total of 2,168 fish (2,022,871 g) representing eight species were captured in standard gang index gill nets set in Gauer Lake (Tables 5.3.7-3 and 5.3.7-4). Each of the eight species were captured in each of the three years of sampling. For all years combined, the most common species captured in standard gang index gill nets was White Sucker (mean relative abundance = 27.9%) (Table 5.3.7-3 and Figure 5.3.7-10). White Sucker also accounted for the highest proportion of total biomass (38.0%) (Table 5.3.7-4).

For the small mesh index gill nets for all years of sampling, a total of 1,091 fish (66,886 g) representing 13 species were captured (Tables 5.3.7-5 and 5.3.7-6). The number of species captured ranged from a low of nine in 2009 and 2010 to a high of 12 in 2008. Spottail Shiner was the most common species captured overall (mean relative abundance = 48.6%) (Table 5.3.7-5 and Figure 5.3.7-10). For small-bodied fish species from the small mesh index gillnet catch, Spottail Shiner accounted for the highest proportion of total biomass (3.2%) (Table 5.3.7-6).

5.3.7.4 Catch Per Unit of Effort (CPUE)/ Biomass Per Unit of Effort (BPUE)

Granville Lake

Mean overall total CPUE and BPUE for the standard gang index gillnet catch in Granville Lake were 78.6 fish and 68,627 g/100m of net/24 h, respectively (Tables 5.3.7-7 and 5.3.7-8). Mean total CPUE and BPUE values were highest in 2008 at 85.9 fish and 79,650 g and lowest in 2009 at 73.5 fish and 62,417 g (Tables 5.3.7-7 and 5.3.7-8, Figures 5.3.7-11 and 5.3.7-12). The highest individual species' mean overall CPUE values was recorded for White Sucker (48.1) (Table 5.3.7-7 and Figure 5.3.7-13). The highest species-specific mean overall BPUE values was also recorded for White Sucker (49,609 g) (Table 5.3.7-8, Figure 5.3.7-14).

For the small mesh index gillnet catch, the mean overall total CPUE and BPUE values were 90.9 fish and 3,753 g/30m of net/24 h, respectively (Tables 5.3.7-9 and 5.3.7-10). The mean total CPUE value was highest in 2008 at 109.4 fish (Table 5.3.7-9, Figure 5.3.7-11) while the mean total BPUE value was highest in 2010 at 4,270 g (Table 5.3.7-10, Figure 5.3.7-12). Mean total CPUE was lowest in 2009 at 55.1 fish while mean total BPUE was lowest in 2008 at 3,444 g. The highest mean overall CPUE values for individual species were recorded for Sauger (17.3) followed by Yellow Perch (16.8) (Table 5.3.7-9, Figure 5.3.7-13). The highest mean overall BPUE value for small-bodied fish species was for Yellow Perch (250) (Table 5.3.7-10, Figure 5.3.7-14).

Mean overall CPUE and BPUE for Northern Pike, Lake Whitefish, Walleye and all species combined captured in standard gang index gill nets are provided in Figures 5.3.7-15 and 5.3.7-16, respectively, by site. Northern Pike were captured at all sampling sites and had consistently low CPUE and BPUE values among sites and between years. Likewise, Lake Whitefish were captured at nearly all sites and had fairly low and consistent CPUE and BPUE values. Walleye were captured at all sampling sites and had low values for most sites with the exception of GN-04 which was higher and more variable between years than the other sites, particularly for CPUE. The mean overall CPUE value for total catch was relatively consistent among sites, however there was some variability present both among sites and between years for both CPUE and BPUE.

Southern Indian Lake - Area 1

Mean total CPUE and BPUE for the standard gang index gillnet catch in Southern Indian Lake – Area 1 in 2009 was 32.2 fish and 25,511 g (Tables 5.3.7-7 and 5.3.7-8, Figures 5.3.7-11 and 5.3.7-12). The highest mean CPUE values for the 2009 standard gang index gillnet catch in Southern Indian Lake (Area 1) were recorded for Lake Whitefish (6.7 fish) followed by Cisco

(5.1 fish) (Table 5.3.7-7, Figure 5.3.7-13). The highest mean BPUE values for the same year were recorded for Lake Whitefish (6,664 g) followed by Longnose Sucker (5,159 g) (Table 5.3.7-8, Figure 5.3.7-14).

For the one small mesh gill net that was set in 2009, the mean CPUE and BPUE was 4.0 fish and 284 g (Tables 5.3.7-9 and 5.3.7-10, Figures 5.3.7-11 and 5.3.7-12). A mean CPUE value of 1.3 was recorded for each of the three species captured (Lake Whitefish, Troutperch and Slimy Sculpin) (Table 5.3.7-7, Figure 5.3.7-13).

Mean CPUE and BPUE for Northern Pike, Lake Whitefish, Walleye and all species combined captured in standard gang index gill nets are provided in Figures 5.3.7-17 and 5.3.7-18, respectively, by site. Northern Pike were captured at approximately half of the sites and had similar CPUE and BPUE among the sites where they were present, with the exception of GN-01 which was higher for both values. Lake Whitefish were present at most sites and had consistent CPUE and BPUE values among sites with the exception of GN-12 which was higher for both values. Walleye were only captured at two sites and had nearly identical CPUE and BPUE values for these sites. The mean CPUE and BPUE values for the total catch varied considerably among sites.

Southern Indian Lake - Area 6

Mean total CPUE and BPUE for the standard gang index gillnet catch in Southern Indian Lake – Area 6 in 2010 was 35.6 fish and 16,834 g (Tables 5.3.7-7 and 5.3.7-8, Figures 5.3.7-11 and 5.3.7-12). The highest individual species' mean CPUE values from the 2010 standard gang index gillnet catch in Southern Indian Lake - Area 6 were recorded for Sauger (12.8 fish) (Table 5.3.7-7, Figure 5.3.7-13). The highest mean BPUE values were recorded for Cisco (3,962 g) followed by White Sucker (3,286 g) and Longnose Sucker (2,889 g) (Table 5.3.7-8, Figure 5.3.7-14).

For the small mesh index gill net catch, the mean total CPUE and BPUE in 2010 was 52.7 fish and 4,717 g (Tables 5.3.7-9 and 5.3.7-10, Figures 5.3.7-11 and 5.3.7-12). The highest mean CPUE values were recorded for Sauger (25.4 fish) (Table 5.3.7-9, Figure 5.3.7-13). The highest mean BPUE values for small-bodied fish species were recorded for Troutperch (64 g) (Table 5.3.7-10, Figure 5.3.7-14).

Mean CPUE and BPUE for Northern Pike, Lake Whitefish, Walleye, and all species combined captured in standard gang index gill nets are provided in Figures 5.3.7-19 and 5.3.7-20, respectively, by site. Northern Pike were captured at most sites and Lake Whitefish were captured at all sites; both these species had low and consistent CPUE and BPUE values among sites. Walleye were only captured at three sites and had low CPUE and BPUE values at all of them. The mean CPUE and BPUE values for all fish combined were highly variable among sites.

Southern Indian Lake (Area 4)

Mean overall total CPUE and BPUE for the standard gang index gillnet catch in Southern Indian Lake - Area 4 were 58.0 fish and 38,183 g, respectively (Tables 5.3.7-7 and 5.3.7-8). Mean total CPUE and BPUE values for standard gang index gillnet catches between 2008 and 2010 showed a progressive decline to less than half of the original value (Tables 5.3.7-7 and 5.3.7-8, Figures 5.3.7-11 and 5.3.7-12. The mean total CPUE and BPUE values for the standard gang index gillnet catch were highest in 2008 at 84.4 fish and 54,276 g, respectively, and lowest in 2010 at 35.1 fish and 22,418 g, respectively. The highest individual species' mean overall CPUE values for the standard gang index gillnet catch in Southern Indian Lake - Area 4 were recorded for Longnose Sucker (16.9 fish), Lake Whitefish (16.0 fish), Cisco (13.0 fish), and Burbot (6.8 fish) (Table 5.3.7-7, Figure 5.3.7-13). The highest species-specific mean overall BPUE values were recorded for Longnose Sucker (13,127 g), Lake Whitefish (8,707 g), Burbot (6,172 g), and Northern Pike (6,109 g) (Table 5.3.7-8, Figure 5.3.7-14).

For the small mesh index gillnet catch, the mean overall total CPUE and BPUE values were 9.6 fish and 1,265 g, respectively (Tables 5.3.7-9 and 5.3.7-10). The mean total CPUE value was highest in 2008 at 14.1 fish and lowest in 2009 at 5.5 fish (Table 5.3.7-9, Figure 5.3.7-11). Mean total BPUE for the small mesh index gillnet catch did not mirror the mean total CPUE, with the highest mean total BPUE value being recorded in 2009 (1,773 g) and the lowest being recorded in 2008 (923 g) (Table 5.3.7-10, Figure 5.3.7-12). The highest individual species' mean overall CPUE values were recorded for Cisco (5.9 fish) (Table 5.3.7-9, Figure 5.3.7-13). Highest mean overall BPUE values for small-bodied fish species were recorded for Troutperch (14 g) (Table 5.3.7-10, Figure 5.3.7-14).

Mean overall CPUE and BPUE for Northern Pike, Lake Whitefish, Walleye, and all species combined captured in standard gang index gill nets are provided in Figures 5.3.6-21 and 5.3.6-22, respectively, by site. Northern Pike were captured at nearly all sites and had fairly consistent CPUE and BPUE values both among sites and between years. Lake Whitefish were captured at all 27 sites and while they showed consistency among sites, there was variability present between years, particularly for GN-7 and GN-18. Walleye were captured only at three sites and had low CPUE and BPUE values. The mean overall CPUE and BPUE values for all fish combined were found to be highly variable both among sites and between years.

Gauer Lake

Mean overall total CPUE and BPUE for the standard gang index gillnet catch in Gauer Lake were 66.9 fish and 61,588 g, respectively (Tables 5.3.7-7 and 5.3.7-8). Mean total CPUE and BPUE values were similar between 2009 (59.9 fish and 55,082 g) and 2010 (61.1 fish and 54,715 g) and somewhat higher in 2008 (79.9 fish and 74,967 g) (Tables 5.3.7-7 and 5.3.7-8, Figures 5.3.7-11 and 5.3.7-12). The highest individual species' mean overall CPUE values for the standard gang index gillnet catch in Gauer Lake were recorded for White Sucker (18.7 fish), Lake Whitefish (15.6 fish) and Walleye (13.5 fish) (Table 5.3.7-7, Figure 5.3.7-13). The highest mean overall BPUE values were recorded for White Sucker (23,439 g) (Table 5.3.7-8, Figure 5.3.7-14).

For the small mesh index gillnet catch, mean overall total CPUE and BPUE values were 122.9 fish and 7,753 g, respectively (Tables 5.3.7-9 and 5.3.7-10). Similar to the standard gang catch, mean total CPUE values for 2009 (92.4 fish) and 2010 (112.8 fish) were relatively similar but the value for 2008 was higher at 160.4 fish (Table 5.3.7-9 and Figure 5.3.7-11). Conversely, in the case of mean total BPUE, the value for 2008 (5,228 g) was lower than that for either 2009 (9,314 g) or 2010 (8,717 g). The highest individual species' mean overall CPUE values were recorded for Spottail Shiner (57.8 fish) (Table 5.3.7-9, Figure 5.3.6-13). The highest mean overall BPUE values for small-bodied fish species were recorded for Spottail Shiner (235 g) (Table 5.3.7-10, Figure 5.3.7-14).

Mean overall CPUE and BPUE for Northern Pike, Lake Whitefish, Walleye, and all species combined captured in standard gang index gill nets are provided in Figures 5.3.6-23 and 5.3.6-24, respectively, by site. Northern Pike, Lake Whitefish and Walleye were captured at all sites sampled in Gauer Lake. All three species had consistent CPUE and BPUE values both among sites and between years. The mean overall CPUE and BPUE values for all species combined were fairly consistent, however, there was some variation between years for some sites.

5.3.7.5 Size and Condition

Fish length, weight and condition factor data for Northern Pike, Lake Whitefish, and Walleye captured in Upper Churchill River Region waterbodies are presented in Tables 5.3.7-11, 5.3.7-12, and 5.1.7-13, respectively. Mean and median fork lengths of Northern Pike, Lake Whitefish, and Walleye, by waterbody, year, and mesh size, captured in Upper Churchill River Region waterbodies are presented in Figures 5.3.7-25, 5.3.7-26, and 5.3.7-27, respectively. Fork length frequency distributions for Northern Pike, Lake Whitefish, and Walleye, by waterbody and year, captured in Upper Churchill River Region waterbodies are presented in Figures 5.3.7-28, 5.3.7-29, and 5.3.7-30, respectively.

Granville Lake

Fish length, weight and condition factor data were collected and analyzed (by mesh size and total catch) for 82 Northern Pike, 136 Lake Whitefish, and 243 Walleye captured in standard gang index gill nets set in Granville Lake during 2008, 2009, and 2010 (Tables 5.3.7-11, 5.3.7-12 and 5.3.7-13). Mean fork lengths for all three species were fairly similar from year to year. Mean (±SD) fork lengths for Northern Pike were 548 (±109) mm and 607 (±95) mm for 2009 and 2010, respectively. Mean (±SD) fork lengths for Lake Whitefish were 281 (±100) mm, 366 (±83) mm, and 319 (±97) mm, and for Walleye were 369 (±62) mm, 382 (±64) mm and 358 (±68) mm for the same three years.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes are presented in Figures 5.3.7-25, 5.3.7-26 and 5.3.7-27, respectively. In general, mean fork length increased with increasing mesh size for all three species. Similarly, fork length frequency distributions for the same species are provided in Figures 5.3.7-28, 5.3.7-29 and 5.3.7-30, respectively.

As was the case for fork length, mean weights for Northern Pike and Walleye from Granville Lake were relatively similar among years. Mean weights for Lake Whitefish were somewhat more dissimilar, with an almost doubling of mean weight from 2008 to 2009 and a decrease again in 2010 to a value similar to that in 2008. Mean (±SD, where calculated) weights for Northern Pike were 1,129 g, 1,297 (±644) g, and 1,663 (±950) g for 2008, 2009, and 2010, respectively (Table 5.3.7-11). Mean (±SD, where calculated) weights for Lake Whitefish were 507 (±568) g, 936 g, and 581 (±496) g, respectively (Table 5.3.7-12). Mean (±SD, where calculated) weights for Walleye were 599 (±283) g, 685 g, and 559 g, respectively (Table 5.3.7-13). Mean (±SD) condition factors for Northern Pike in 2009 and 2010 were 0.70 (±0.06) and 0.68 (±0.08), respectively, for Northern Pike while for Lake Whitefish in 2008, 2009 and 2010 values were 1.50 (±0.18), 1.61 (±0.19), and 1.40 (±0.20), respectively. Mean (±SD) condition factors for Walleye in 2008, 2009, and 2010 were 1.08 (±0.10), 1.10 (±0.14) and 1.10 (±0.10), respectively.

Southern Indian Lake - Area 1

Fish length, weight and condition factor data were collected and analyzed (by mesh size and total catch) from 41 Northern Pike, 62 Lake Whitefish and 12 Walleye captured in standard gang index gill nets set in Southern Indian Lake - Area 1 in 2009 (Tables 5.3.7-11, 5.3.7-12 and 5.3.7-13). Mean (±SD) fork lengths were as follows: Northern Pike = 540 (±64) mm; Lake Whitefish = 370 (±87) mm; and Walleye = 359 (±67) mm.

The mean fork length of Northern Pike, Lake Whitefish, and Walleye captured by various mesh sizes is presented in Figures 5.3.7-25, 5.3.7-26 and 5.3.7-27, respectively. Similarly, fork length frequency distributions for the same species are provided in Figures 5.3.7-28, 5.3.7-29, and 5.3.7-30 respectively.

Mean (±SD) weights for Northern Pike, Lake Whitefish, and Walleye were 1,041 (±337) g, 987 (±597) g, and 588 (±303) g, respectively. Mean (±SD) condition factors for these three species were as follows: Northern Pike = 0.66 (±0.08); Lake Whitefish = 1.66 (±0.20); and Walleye = 1.17 (±0.09).

<u>Southern Indian Lake - Area 6</u>

Fish length, weight, and condition factor data were collected and analyzed (by mesh size and total catch) from 26 Northern Pike, 28 Lake Whitefish and five Walleye captured in standard gang index gill nets set in Southern Indian Lake – Area 6 in 2010 (Tables 5.3.7-11, 5.3.7-12, and 5.3.7-13). Mean (±SD) fork lengths were as follows: Northern Pike = 516 (±86) mm; Lake Whitefish = 322 (±61); and Walleye = 326 (±119) mm.

The mean fork length of Northern Pike, Lake Whitefish, and Walleye captured by various mesh sizes is presented in Figures 5.3.7-25, 5.3.7-26 and 5.3.7-27 respectively. Similarly, fork length frequency distributions for the same species are provided in Figures 5.3.7-28, 5.3.7-29 and 5.3.7-30, respectively.

Mean (±SD) weights for Northern Pike, Lake Whitefish, and Walleye were 987 (±505) g, 564 (±307) g, and 540 (±500) g, respectively. Mean (±SD) condition factors for these three species were as follows: Northern Pike = 0.65 (±0.06); Lake Whitefish = 1.55 (±0.11); and Walleye = 1.05 (±0.02).

<u>Southern Indian Lake - Area 4</u>

Fish length, weight and condition factor data were collected and analyzed (by mesh size and total catch) for 151 Northern Pike, 1,053 Lake Whitefish, and 12 Walleye captured in standard gang index gill nets set in Southern Indian Lake - Area 4 during 2008, 2009, and 2010 (Tables 5.3.7-11, 5.3.7-12 and 5.3.7-13). Fork length only was collected from six additional Northern Pike and 14 Lake Whitefish, while weight only was collected from an additional 168 Northern Pike, four Lake Whitefish, and one Walleye. Mean fork lengths for Northern Pike and Lake Whitefish were similar among years (no fork length data collected for Northern Pike in 2008), while Walleye were captured only in 2010. Mean (±SD) fork lengths for Northern Pike were 572 (±68) mm and 560 (±85) mm for 2009 and 2010, respectively. Mean (±SD) fork lengths for Lake Whitefish were 334 (±57) mm, 337 (±67) mm, and 322 (±57) mm for 2008, 2009, and 2010, respectively. Mean (±SD) fork length for Walleye in 2010 was 343 (±61) mm.

The mean fork length of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes is presented in Figures 5.3.7-25, 5.3.7-26, and 5.3.7-27, respectively. Similarly, fork length frequency distributions for the same species are provided in Figures 5.3.7-28, 5.3.7-29 and 5.3.7-30, respectively.

As was the case for fork length, mean weights for Northern Pike from Southern Indian Lake - Area 4 were relatively similar in 2008, 2009 and 2010, while mean weights for Lake Whitefish showed a slight decrease from 2008 through 2010. Mean (±SD, where calculated) weights for Northern Pike were 1,236 g, 1,271 (±420) g, and 1,326 (±631) g for 2008, 2009, and 2010, respectively. Mean (±SD) weights for Lake Whitefish were 555 (±279) g, 527 g, and 460 (±232) g in 2008, 2009 and 2010, respectively. Mean (±SD) weight for Walleye in 2010 was 562 (±324) g. Mean (±SD) condition factors were 0.65 (±0.08) and 0.71 (±0.07) for 2009 and 2010, respectively, for Northern Pike; 1.35 (±0.17), 1.31 (±0.13) and 1.25 (±0.12) for Lake Whitefish in 2008, 2009 and 2010, respectively; and 1.20 (±0.11) for Walleye in 2010.

Gauer Lake

Fish length, weight and condition factor data were collected and analyzed (by mesh size and total catch) for 336 Northern Pike, 489 Lake Whitefish, and 450 Walleye captured in standard gang index gill nets set in Gauer Lake during 2008, 2009 and 2010 (Tables 5.3.7-11, 5.3.7-12 and 5.3.7-13). Weights only were collected from an additional 34 Northern Pike, 24 Lake Whitefish, and 80 Walleye. Mean fork lengths for all three species were fairly similar among years. Mean (±SD) fork lengths for Northern Pike were 564 (±118) mm, 563 (±112) mm, and 557 (±107) mm for 2008, 2009, and 2010, respectively. Mean (±SD) fork lengths for Lake Whitefish were 352 (±78) mm, 363 (±77) mm, and 348 (±68) mm, and for Walleye were 388 (±57) mm, 390 (±63) mm, and 387 (±58) mm for 2008, 2009, and 2010, respectively.

The mean fork lengths of Northern Pike, Lake Whitefish and Walleye captured by various mesh sizes are presented in Figures 5.3.7-25, 5.3.7-26 and 5.3.7-27, respectively. In general, mean fork length increased with increasing mesh size for all three species. Similarly, fork length frequency distributions for the same species are provided in Figures 5.3.7-28, 5.3.7-29 and 5.3.7-30, respectively.

As was the case for fork length, mean weights for Northern Pike and Walleye from Gauer Lake were relatively similar in 2008, 2009 and 2010 while mean weights for Lake Whitefish varied somewhat among years. Mean (±SD, where calculated) weights for Northern Pike were 1,372 g, 1,229 g, and 1,293 (±936) g for 2008, 2009, 2010, respectively. Mean weights for Lake Whitefish were 729 g, 816 g, and 646 g for 2008, 2009 and 2010, respectively. Mean weights for Walleye were 629 g, 613 g, and 630 g respectively for these same years. Mean (±SD) condition factors for 2008, 2009, and 2010 were 0.69 (±0.08), 0.67 (±0.07), and 0.66 (±0.07), respectively, for Northern Pike, 1.45 (±0.19), 1.49 (±0.14), and 1.39 (±0.13), respectively, for Lake Whitefish and 1.10 (±0.10), 1.09 (±0.09) and 1.11 (±0.09), respectively, for Walleye (Tables 5.3.7-11, 5.3.7-12, and 5.3.7-13).

5.3.7.6 Age Composition

Year-class and age-frequency distributions for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets in Upper Churchill River Region waterbodies are presented in Tables 5.3.7-14 – 5.3.7-16 and Tables 5.3.7-17 – 5.3.7-19, respectively. Age-frequency distributions for Northern Pike, Lake Whitefish, and Walleye are also illustrated in Figures 5.3.7-31 – 5.3.7-33, respectively. Where sufficient data existed, mean fork length, weight, and condition factor, by age and year class, for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies are presented in Tables 5.3.7-20 – 5.3.7-22. Where sufficient data existed, von Bertalanffy growth curves were produced and are presented for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies in Figures 5.3.7-34 – 5.3.7-36, respectively.

Granville Lake

Age-frequency distributions were calculated for Northern Pike captured in standard gang index gill nets set in Granville Lake in 2009 and 2010 and for Lake Whitefish and Walleye captured during 2008, 2009 and 2010. Age-frequency distributions are presented by cohort (Tables 5.3.7-14 – 5.3.7-16) and by age (Tables 5.3.7-17 - 5.3.7-19, Figures 5.3.7-31 - 5.3.7-33). Year classes represented ranged from 1995 to 2007 for Northern Pike, 1992 to 2008 for Lake Whitefish, and 1994 to 2007 for Walleye.

The 2009 and 2010 Northern Pike data suggest good representation across several year classes with no weak or missing year classes (Table 5.3.7-14, Figure 5.3.7-31). For Lake Whitefish, the data from 2009 and 2010 suggest that a strong year-class was produced in 2002, and good year classes also appear to have been produced in 2005-2007 (Table 5.3.7-15, Figure 5.3.7-32). The 2010 data for Walleye suggest that strong year classes were produced each year from 2001 to 2006 except for 2004 (Table 5.3.7-16, Figure 5.3.7-33). Walleye from the 2004 cohort are completely absent from the catch for all three sampling years suggesting a weak or missing year-class.

Length, weight and condition factor by age and year class data from 2008, 2009, and 2010 for Northern Pike (2009 and 2010 only), Lake Whitefish, and Walleye are provided in Tables 5.3.7-20, 5.3.7-21 and 5.3.7-22, respectively. Fitted von Bertalanffy growth curves are provided in Figures 5.3.7-34, 5.3.7-35 and 5.3.7-36.

Southern Indian Lake - Area 1

Age-frequency distributions were calculated for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Southern Indian Lake - Area 1 during 2009. Age-frequency distributions are presented by cohort (Tables 5.3.7-14 - 5.3.7-16) and by age (Tables 5.3.7-17 - 5.3.7-19, Figures 5.3.7-31 - 5.3.7-33). Year-classes ranged from 1998 to 2004 for Northern Pike, 1998 to 2007 for Lake Whitefish, and 1997 to 2006 for Walleye.

The data for Northern Pike suggest that a weak cohort may have been produced in 2002, while for Lake Whitefish 2003 and 2004 cohorts appear to be underrepresented in the catch. Too few Walleye were captured and aged to draw any inferences on cohort strength.

Length, weight, and condition factor data by age and year class are provided for Northern Pike, Lake Whitefish, and Walleye in Tables 5.3.7-20, 5.3.7-21, and 5.3.7-22, respectively. The fitted von Bertalanffy growth curve for Lake Whitefish is provided in Figure 5.3.7-35.

Southern Indian Lake - Area 6

Age-frequency distributions were calculated for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets in Southern Indian Lake - Area 6 during 2010. Age-frequency distributions are presented by cohort (Tables 5.3.7-14 - 5.3.7-16) and by age (Tables 5.3.7-17 - 5.3.7-19, Figures 5.3.7-31 - 5.3.7-33). Year-classes ranged from 1997 to 2008 for Northern Pike, from 2001 to 2008 for Lake Whitefish, and from 2000 to 2006 for Walleye.

No particularly strong cohorts are apparent in the Northern Pike data, while for Lake Whitefish a relatively strong cohort is suggested from 2006 with no fish aged at greater than nine years. Too few ages were obtained from Walleye to draw any inferences on cohort strength.

Length, weight and condition factor data by age and year class are provided for Northern Pike, Lake Whitefish, and Walleye in Tables 5.3.7-20, 5.3.7-21 and 5.3.7-22, respectively. Fitted von Bertalanffy growth curves for Northern Pike and Lake Whitefish are provided in Figures 5.3.7-34 and 5.3.7-35, respectively.

Southern Indian Lake - Area 4

Age-frequency distributions were calculated for Northern Pike captured in standard gang index gill nets set in Southern Indian Lake – Area 4 in 2009 and 2010 and for Lake Whitefish and Walleye captured during 2010. Age-frequency distributions are presented by cohort (Tables 5.3.7-14 - 5.3.6-16) and by age (Tables 5.3.7-17 - 5.3.7-19, Figures 5.3.7-31 - 5.3.7-33). Year-classes ranged from 1992 to 2007 for Northern Pike, 1988 to 2006 for Lake Whitefish, and 2002 to 2006 for Walleye.

The Northern Pike data show good representation by a broad range of year-classes, with a large number of older fish present in the 2009 catch. The Lake Whitefish data suggest that the Southern Indian Lake – Area 4 population appears to be dominated by a very strong 1999 cohort and, to a lesser extent, the 2000 cohort. Few younger fish are present in the catch from Area – 4. Too few Walleye were captured and aged to draw any inferences on cohort strength.

Length, weight and condition factor data by age and year class are provided for Northern Pike, Lake Whitefish, and Walleye in Tables 5.3.7-20, 5.3.7-21, and 5.3.7-22, respectively. Fitted von Bertalanffy growth curves for Northern Pike and Lake Whitefish are provided in Figures 5.3.7-34 and 5.3.7-35. Lake Whitefish from Southern Indian Lake – Area 4 appear to grow at a slower rate than those of other waterbodies within the region (Figure 5.3.7-35).

Gauer Lake

Age-frequency distributions were calculated for Northern Pike, Lake Whitefish, and Walleye captured in standard gang index gill nets set in Gauer Lake during 2008, 2009 and 2010. Age-frequency distributions are presented by cohort (Tables 5.3.7-14 - 5.3.7-16) and by age (Tables 5.3.7-17 - 5.3.7-19, Figures 5.3.7-31 - 5.3.7-33). Year-classes represented ranged from 1993 to 2008 for Northern Pike, from 1980 to 2007 for Lake Whitefish, and from 1990 to 2006 for Walleye.

The data for all three species suggest good representation across a broad range of year-classes with few weak or exceptionally strong cohorts.

Length, weight and condition factor data by age and year class for Northern Pike, Lake Whitefish, and Walleye are provided in Tables 5.3.7-20, 5.3.7-21, and 5.3.7-22, respectively. Fitted von Bertalanffy growth curves for Northern Pike, Lake Whitefish, and Walleye are provided in Figures 5.3.7-34, 5.3.7-35, and 5.3.7-36, respectively.

5.3.7.7 Deformities, Erosion, Lesions and Tumours (DELTs)

Granville Lake

A total of three instances of Deformities, Erosion, Lesions, and Tumours (DELTs) were recorded from 1,090 (0.3 %) individuals of five species of fish examined from Granville Lake in 2008, 2009, and 2010 (Table 5.3.7-23). The highest incidence rate was observed to occur in Walleye (0.4%, n = 245), followed by White Sucker (0.4%, n = 567). In total, one lesion was found on Walleye and one erosion and one lesion were found on White Sucker. Northern Pike (n= 136), Lake Whitefish (n= 88), and Sauger (n= 54) also were examined for DELTs but none were observed.

Southern Indian Lake - Area 1

No instances of DELTs were recorded from 142 (0%) individuals of four species of fish. A total of 24 White Sucker, 43 Northern Pike, 63 Lake Whitefish, and 12 Walleye were examined from Southern Indian Lake - Area 1 in 2009 (Table 5.3.7-23).

Southern Indian Lake - Area 6

A total of one instance of a DELT was recorded from 255 (0.4%) individuals of five species of fish examined from Southern Indian Lake - Area 6 in 2009 (Table 5.3.7-23). In total, one erosion was observed on a White Sucker (2.4%, n = 42). Northern Pike (n= 26), Lake Whitefish (n = 28), Sauger (n= 154), and Walleye (n = 5) also were examined for DELTs but none were observed.

Southern Indian Lake - Area 4

A total of one instance of a DELT was recorded from 1,425 (0.1%) individuals of five species of fish examined from Southern Indian Lake - Area 4 in 2008, 2009, and 2010 (Table 5.3.7-23). One erosion was observed on a Lake Whitefish (0.1%, n = 1,067). White Sucker (n = 20), Northern Pike (n= 324), Sauger (n= 2) and Walleye (n = 12) also were examined for DELTs but none were observed.

Gauer Lake

A total of 18 instances of DELTs were recorded from 1,868 (1.0%) individuals of four species of fish examined from Gauer Lake in 2008, 2009, and 2010 (Table 5.3.7-23). The highest incidence rate was observed to occur in White Sucker (2.2%, n = 604), followed by Northern Pike (0.6%, n = 328), Lake Whitefish (0.4%, n = 489) and Walleye (0.2%, n = 447). In total, seven deformities, three lesions and three tumours were found on White Sucker; one lesion and one tumour were found on Northern Pike; two lesions were found on Lake Whitefish; and one lesion was found on Walleye.

5.3.7.8 Index of Biotic Integrity (IBI)

Index of Biotic Integrity (IBI) scores based on 11 metrics were calculated for all Upper Churchill River Region waterbodies. IBI scores varied from 44.0 (Granville Lake 2008) to 59.9 (Southern Indian Lake – Area 4, 2008) with Gauer Lake having scores ranging from 54.1 to 59.2 (Table 5.3.7-24 and Figure 5.3.7-37). With the exception of Southern Indian Lake - Area 4, species assemblages were similar for on-system and off-system waterbodies. Southern Indian Lake - Area 4 had the lowest number of species ranging from 8 - 10 whereas other waterbodies had values ranging from 11 to 14 species. All waterbodies had two or three sensitive species present. Southern Indian Lake - Area 6 had the lowest proportion of tolerant individuals (11.1%) while Granville Lake had considerably higher proportions over all three years (47.7 to 53.0%). The number of insectivore species in all areas of Southern Indian Lake ranged from four to seven while the number of these species in Granville and Gauer lakes ranged from seven to 10. Evenness values ranged from 4.65 (Southern Indian Lake - Area 4, 2009) to 7.73 (Southern Indian Lake - Area 1) for on-system waterbodies, while evenness values in Gauer Lake ranged from 7.52 to 8.29. Areas 1, 4, and 6 within Southern Indian Lake had reasonably similar proportions of insectivore, omnivore, and piscivore biomass whereas Granville Lake was dominated by omnivorous biomass in all three years of sampling with very little insectivore biomass. The proportion of simple lithophilic spawners in Southern Indian Lake ranged from 0.85 in Southern Indian Lake - Area 1 to 0.92 in Southern Indian Lake - Area 4. In Granville Lake the proportion of simple lithophilic spawners was approximately 0.81 while in Gauer Lake it was approximately 0.57. CPUE ranged from 32.2 (Southern Indian Lake - Area 1) to 85.9 (Granville Lake 2008). Percentage of deformities, erosion, lesions, and tumours was less than 1% for all waterbodies with the exception of Gauer Lake in 2008 (1.9%).

5.3.7.9 Spatial Comparisons

Overall, the fish assemblage, as assessed using standard gang index gillnet sets, in sampled on-system Upper Churchill River waterbodies was found to be dominated by White Sucker, Longnose Sucker, Cisco, Lake Whitefish, Sauger, and Northern Pike (Table 5.3.7-3). The fish community in Gauer Lake was similar to that of Granville Lake with the exception that Sauger was not present in the catch and Lake Whitefish and Northern Pike were more common in Gauer Lake than Granville Lake. Within Southern Indian Lake, Area 6 was found to be somewhat dissimilar to Areas 1 and 4 by having a lower abundance of Lake Whitefish, Longnose Sucker, and Burbot. Area 1 and Area 6 differed from Area 4 in that they both had a much higher abundance of White Sucker and Sauger in the catch.

With respect to small-bodied fish species captured in the small mesh index gillnet catches, Yellow Perch, Spottail Shiner, Emerald Shiner and Troutperch generally dominated the catch in both Granville and Gauer lakes (Table 5.3.7-4). These species were typically not very abundant in any of the three sampled areas of Southern Indian Lake, with the exception of Troutperch in Area 6. Logperch (*Percina caprodes*) was captured only in Granville Lake and Gauer Lake and Lake Chub (*Couesius plumbeus*) was only found in Gauer Lake. Slimy Sculpin was found in Granville Lake, Southern Indian Lake (Areas 1 and 4) but was not part of the catch from Gauer Lake.

Moving downstream within the Upper Churchill River Region, the catch in the off-system waterbody Granville Lake was comprised of 15 species, all of which (with the exception of Shorthead Redhorse [*Moxostoma macrolepidotum*] and Logperch) were found in the on-system Upper Churchill River Region waterbodies sampled. Logperch were also present in the other off-system waterbody, Gauer Lake. The fish assemblage captured in Southern Indian Lake - Area 1 was comprised of 11 species, all of which were also found in other Lower Churchill River Region waterbodies. Twelve species were captured in Southern Indian Lake - Area 6, all of which were found in other on-system waterbodies in the region. Eleven species were captured in Southern Indian Lake - Area 4, all of which were captured in other on-system waterbodies in the region. As noted previously, small bodied species were not well represented in Southern Indian Lake. Emerald Shiner were present only in Area 6, small numbers of Spottail Shiner were captured in Area 6 and Area 4, and Yellow Perch were not captured in small mesh index gill nets set in any of the three areas, although small numbers of this species were captured in standard gang index gill nets set in Area 1 and Area 6. The catch in Gauer Lake was comprised of 13 species. Sauger was notably absent from the catch in Gauer Lake while Lake Chub were present. Otherwise the species composition as reflected in the standard gang and small mesh index gillnet catches from Gauer Lake was very similar to that in Granville Lake.

A comparison of mean CPUE values for the standard gang index gillnet catch from the three annual Lower Churchill River Region waterbodies (Granville Lake, Southern Indian Lake - Area 4, and Gauer Lake) and the two rotational waterbodies (Southern Indian Lake - Areas 1 and 6) are presented in Table 5.3.7-7. Granville Lake was found to have a similar overall CPUE to that of Gauer Lake, both off-system reference waterbodies. In Southern Indian Lake, CPUE values in Areas 1 and 6 were approximately one half that of Granville Lake. Overall CPUE in Southern Indian Lake - Area 4 was closer to that of Granville and Gauer lakes, but annual total CPUE fell from 2008 through to 2010, with a value in 2010 that was less than half of that in 2008.

With respect to individual species captured in the standard gang index gill nets, the overall CPUE for White Sucker was noticeably higher in Granville Lake than in Southern Indian Lake – Area 4, farther downstream in the region. Gauer Lake had a CPUE value for White Sucker approximately midway between that for Granville Lake and Southern Indian Lake – Area 4. Lake Whitefish CPUE was comparable between Southern Indian Lake – Area 4 and Gauer Lake, with a considerably lower value in Granville Lake. Walleye CPUE in Gauer Lake was considerably higher than values for Granville Lake and Southern Indian Lake – Area 4. Cisco CPUE in Southern Indian Lake – Area 4 was considerably higher than values for Granville and Gauer lakes. As noted previously, Sauger was absent from the catch in Gauer Lake but was present in all other waterbodies in the region.

Notable differences in the CPUE values for small-bodied fish species captured in small mesh index gill nets in on- and off-system waterbodies in the Upper Churchill River Region were evident, particularly with respect to Spottail Shiner, Emerald Shiner, Troutperch, and Yellow Perch (Table 5.3.7-9). As noted previously, with the exception of Troutperch in Southern Indian Lake – Area 6, CPUEs for all four small bodied species were consistently higher in Granville and Gauer lakes than in Southern Indian Lake.

A comparison of BPUE values for standard gang and small mesh index gillnet catches from all sampled waterbodies in the region are provided in Figure 5.3.7-12 and Tables 5.3.7-8 and 5.3.7-10. In general, total catch BPUE values from standard gang index gill nets were comparable between Granville Lake and Gauer Lake. BPUE in Southern Indian Lake – Area 4 was lower and was characterized by declining BPUE in each of the three sampling years. White Sucker accounted for the majority of the biomass in Granville Lake, with a BPUE value that was nearly 25 times as high as that of Southern Indian Lake – Area 4 and approximately twice as high as that in Gauer Lake. With the exception of Southern Indian Lake - Area 6, Lake Whitefish showed an increasing trend in BPUE from Granville Lake to Southern Indian Lake. Conversely, Walleye showed a decreasing trend from Granville Lake to Southern Indian Lake. BPUE values for Troutperch captured in on-system waterbodies were generally similar but Spottail Shiner, Emerald Shiner, and Yellow Perch were virtually absent in Southern Indian Lake. The BPUE for Spottail Shiner, Emerald Shiner, and Troutperch was higher in Gauer Lake than in Granville Lake, but Yellow Perch BPUE was highest in Granville Lake.

Within each waterbody, site variability was examined by comparing mean CPUE values from the standard gang index gill nets for individual sites. With the exception of Southern Indian Lake - Areas 1 and 6, each of which only had one year of data, the three years of collected data (Granville Lake, Southern Indian Lake - Area 4, and Gauer Lake) were pooled for individual sites. Total CPUE values are presented along with values for Northern Pike, Lake Whitefish and

Walleye. In Granville Lake, total CPUE values ranged from approximately 35 (Site GN-11) to approximately 110 (Site GN-10) (Figure 5.3.7-15). In Southern Indian Lake - Area 4 total CPUE values ranged from approximately 30 (Site GN-15) to approximately 95 (Site GN-06) (Figure 5.3.7-21). The range in total CPUE values for Gauer Lake was from approximately 35 at Site GN-07 to approximately 95 at Site GN-08 (Figure 5.3.7-23).

Overall, Southern Indian Lake - Areas 1 and 6 and Gauer Lake had the highest IBI scores (Table 5.3.6-24 and Figure 5.3.6-37) suggesting that, based on the selected metrics, these waterbodies had the best overall fish community condition. IBI scores for Southern Indian Lake - Area 4 showed considerable variability, with the score for 2008 being the single highest score for the region and the scores for 2009 and 2010 being among the lowest. On average, Granville Lake had the lowest overall IBI score for the region.

5.3.7.10 Temporal Variability

CPUE values were used to examine temporal variability within the three waterbodies for which multi-year sampling occurred (Granville Lake, Southern Indian Lake - Area 4, and Gauer Lake) (Table 5.3.7-7). Within Granville Lake, standard gang index gillnet annual total CPUE varied from 73.5 fish in 2009 to 85.9 fish in 2008. In Southern Indian Lake - Area 4 annual total CPUE fell from a high of 84.4 fish in 2008 to 54.5 fish in 2009, and 35.1 fish in 2010. The annual total CPUE in Gauer Lake was also highest in 2008 at 79.9 fish compared to 59.9 fish in 2009 and 61.1 fish in 2010.

In Granville Lake, small mesh index gillnet annual total CPUE decreased from 109.4 fish in 2008 to 55.1 fish in 2009 then increased again in 2010 to near the 2008 value (108.3 fish) (Table 5.3.7-9). Gauer Lake showed a similar pattern although total CPUE values were higher. In Gauer Lake overall CPUE declined from 163.5 fish in 2008 to 92.4 fish in 2009, then increased again to 112.8 fish in 2010. In Southern Indian Lake - Area 4 overall CPUE values were much lower than those in either Granville Lake or Gauer Lake but again showed a similar temporal pattern. Total CPUE values in Southern Indian Lake - Area 4 were 14.1 fish in 2008, 5.5 fish in 2009 and 9.1 fish in 2010.

The IBI values for Granville Lake ranged from a low of 44.0 in 2008 to 48.8 in 2010 (Table 5.3.7-24 and Figure 5.3.7-37). Southern Indian Lake - Area 4 had a much higher IBI value in 2008 (59.9) compared with 2009 (49.1) and 2010 (47.4). The increased IBI value in 2008 is primarily attributed to a higher CPUE metric in that year. The IBI value for Gauer Lake was similar throughout all three years with values ranging from 54.1 in 2009 to 59.2 in 2008.

Water levels and flows did not appear to have any noticeable relationship to the CPUE or IBI value differences noted for either Granville Lake or Southern Indian Lake – Area 4. Additional data will be collected over time and determine if any relationships are apparent in the future.

Table 5.3.7-1. Summary of site-specific physical measurements collected during CAMPP index gillnetting conducted in Upper Churchill River Region waterbodies, 2008-2010.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Granville Lake	GN-01	14	428146	6253537	11-Aug-08	16.33	13.4	10.0	20.0
Granville Lake	GN-03	14	421949	6248814	11-Aug-08	17.03	12.8	16.9	20.3
Granville Lake	GN-04	14	421669	6247998	11-Aug-08	19.82	30.0	6.7	20.3
Granville Lake	GN-05	14	413313	6243328	12-Aug-08	18.53	7.2	6.8	20.0
Granville Lake	GN-06	14	415673	6238861	12-Aug-08	20.20	8.4	8.4	19.8
Granville Lake	GN-07	14	411109	6238140	12-Aug-08	21.32	9.0	7.8	19.7
Granville Lake	GN-09	14	399730	6238925	13-Aug-08	20.13	8.3	5.3	21.6
Granville Lake	GN-10	14	401520	6234549	13-Aug-08	18.98	8.1	7.9	20.9
Granville Lake	GN-11	14	396551	6235043	13-Aug-08	23.45	12.7	13.1	20.8
Granville Lake	GN-12	14	394003	6238449	13-Aug-08	22.65	9.4	9.6	21.2
Granville Lake	GN-13	14	409810	6242419	12-Aug-08	21.92	7.7	6.9	20.0
Granville Lake	GN-14	14	427296	6250747	14-Aug-08	17.85	7.6	10.1	22.4
Granville Lake	SN-04	14	421669	6247998	11-Aug-08	19.82	30.0	6.7	20.3
Granville Lake	SN-07	14	411109	6238140	12-Aug-08	21.32	9.0	7.8	19.7
Granville Lake	SN-09	14	399730	6238925	13-Aug-08	20.13	8.3	5.3	21.6
Granville Lake	GN-01	14	428161	6253597	22-Jul-09	18.25	15.1	5.5	-
Granville Lake	GN-02	14	427318	6250652	22-Jul-09	18.17	12.1	12.6	-
Granville Lake	GN-03	14	421946	6248762	22-Jul-09	19.93	17.0	21.1	-
Granville Lake	GN-05	14	413317	6243243	23-Jul-09	20.73	7.4	7.2	-
Granville Lake	GN-06	14	415624	6239177	23-Jul-09	21.68	10.9	2.6	-
Granville Lake	GN-07	14	411203	6238186	23-Jul-09	22.43	8.0	9.3	-
Granville Lake	GN-08	14	405280	6239071	24-Jul-09	21.78	13.0	12.7	-
Granville Lake	GN-09	14	399704	6239114	24-Jul-09	22.27	2.9	8.0	-
Granville Lake	GN-10	14	401517	6234673	24-Jul-09	24.08	8.0	8.3	-
Granville Lake	GN-11	14	396189	6235417	25-Jul-09	20.60	11.5	10.8	-
Granville Lake	GN-12	14	394540	6237871	25-Jul-09	20.85	3.8	11.8	-
Granville Lake	GN-13	14	389190	6241189	25-Jul-09	21.52	7.7	10.4	-
Granville Lake	SN-02	14	427318	6250652	22-Jul-09	18.17	12.1	12.6	-
Granville Lake	SN-07	14	411203	6238186	23-Jul-09	22.43	8.0	9.2	-
Granville Lake	SN-08	14	405280	6239071	24-Jul-09	21.78	13.0	12.7	-

Table 5.3.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Granville Lake	SN-13	14	389190	6241189	25-Jul-09	21.52	7.7	10.4	-
Granville Lake	GN-01	14	428152	6253598	22-Jul-10	18.93	15.3	4.1	20.8
Granville Lake	GN-02	14	427209	6250881	22-Jul-10	19.60	10.4	8.9	21.7
Granville Lake	GN-03	14	421905	6248787	23-Jul-10	22.55	5.2	19.2	19.6
Granville Lake	GN-04	14	421021	6247986	23-Jul-10	23.25	20.2	2.9	19.9
Granville Lake	GN-05	14	413498	6243271	24-Jul-10	21.60	7.2	6.7	20.7
Granville Lake	GN-06	14	415572	6239186	24-Jul-10	22.17	8.5	3.8	20.8
Granville Lake	GN-07	14	411095	6238205	24-Jul-10	24.57	8.2	7.6	21.1
Granville Lake	GN-08	14	405280	6238958	3-Sep-10	18.93	12.3	13.2	15.8
Granville Lake	GN-09	14	399817	6239030	3-Sep-10	19.50	7.0	3.6	15.5
Granville Lake	GN-10	14	401588	6234567	3-Sep-10	20.53	-	-	-
Granville Lake	GN-11	14	396066	6235566	4-Sep-10	22.28	10.8	10.8	14.6
Granville Lake	GN-12	14	394404	6237833	4-Sep-10	23.08	-	-	-
Granville Lake	SN-06	14	415572	6239186	24-Jul-10	22.17	8.5	3.8	20.8
Granville Lake	SN-09	14	399817	6239030	3-Sep-10	19.50	7.0	3.6	15.5
Granville Lake	SN-12	14	394404	6237833	4-Sep-10	23.08	-	-	-
Southern Indian Lake (Area 1)	GN-01	14	497373	6305287	27-Jul-09	17.50	5.3	15.6	-
Southern Indian Lake (Area 1)	GN-02	14	497354	6306649	27-Jul-09	17.73	15.7	17.8	-
Southern Indian Lake (Area 1)	GN-03	14	497426	6308282	27-Jul-09	17.92	16.9	15.9	-
Southern Indian Lake (Area 1)	GN-04	14	498274	6310374	27-Jul-09	15.90	8.1	8.2	14.2
Southern Indian Lake (Area 1)	GN-05	14	494724	6307726	27-Jul-09	15.92	15.4	19.1	15.2
Southern Indian Lake (Area 1)	GN-06	14	496048	6312355	27-Jul-09	16.47	-	12.1	14.8
Southern Indian Lake (Area 1)	GN-07	14	485006	6303778	28-Jul-09	17.67	3.3	5.1	-
Southern Indian Lake (Area 1)	GN-08	14	483715	6298245	28-Jul-09	17.83	8.6	9.2	-
Southern Indian Lake (Area 1)	GN-09	14	490108	6296218	28-Jul-09	17.83	14.0	4.8	-
Southern Indian Lake (Area 1)	GN-10	14	490740	6305162	28-Jul-09	15.58	-	-	15.0
Southern Indian Lake (Area 1)	GN-11	14	487114	6309751	28-Jul-09	15.32	-	-	15.7
Southern Indian Lake (Area 1)	GN-12	14	481245	6308770	28-Jul-09	15.87	-	-	-
Southern Indian Lake (Area 1)	SN-03	14	497426	6308282	27-Jul-09	17.92	16.9	15.9	-
Southern Indian Lake (Area 6)	GN-01	14	499199	6286626	6-Aug-10	18.83	12.0	12.5	18.4

Table 5.3.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Southern Indian Lake (Area 6)	GN-02	14	496668	6286380	6-Aug-10	19.10	12.2	11.2	18.3
Southern Indian Lake (Area 6)	GN-03	14	498522	6283199	6-Aug-10	20.35	10.0	10.0	18.6
Southern Indian Lake (Area 6)	GN-04	14	499762	6281322	7-Aug-10	23.33	3.7	10.0	18.4
Southern Indian Lake (Area 6)	GN-05	14	501803	6282683	7-Aug-10	21.58	9.6	9.5	18.2
Southern Indian Lake (Area 6)	GN-06	14	503191	6286060	7-Aug-10	20.70	8.2	9.9	18.5
Southern Indian Lake (Area 6)	GN-07	14	502633	6281522	8-Aug-10	22.90	8.7	8.6	18.1
Southern Indian Lake (Area 6)	GN-08	14	504727	6283947	8-Aug-10	24.80	8.3	6.2	18.6
Southern Indian Lake (Area 6)	GN-09	14	500746	6285383	8-Aug-10	21.40	11.4	11.4	18.5
Southern Indian Lake (Area 6)	GN-10	14	505687	6281881	9-Aug-10	20.73	5.5	5.4	18.6
Southern Indian Lake (Area 6)	GN-11	14	504698	6280375	9-Aug-10	20.27	4.7	4.6	18.4
Southern Indian Lake (Area 6)	GN-12	14	506880	6283330	9-Aug-10	19.28	7.0	7.2	18.5
Southern Indian Lake (Area 6)	SN-03	14	498522	6283199	6-Aug-10	20.35	10.0	10.0	18.6
Southern Indian Lake (Area 6)	SN-06	14	503191	6286060	7-Aug-10	20.70	8.2	9.9	18.5
Southern Indian Lake (Area 6)	SN-09	14	500746	6285383	8-Aug-10	21.40	11.4	11.4	18.5
Southern Indian Lake (Area 6)	SN-12	14	506880	6283330	9-Aug-10	19.28	7.0	7.2	18.5
Southern Indian Lake (Area 4)	GN-01	14	548005	6357053	23-Jul-08	16.70	8.4	6.0	17.8
Southern Indian Lake (Area 4)	GN-02	14	542809	6358537	23-Jul-08	17.02	14.1	14.6	17.2
Southern Indian Lake (Area 4)	GN-03	14	543360	6360803	23-Jul-08	17.28	15.9	10.3	18.7
Southern Indian Lake (Area 4)	GN-04	14	542453	6360030	23-Jul-08	18.20	21.5	13.4	18.1
Southern Indian Lake (Area 4)	GN-05	14	537526	6362743	24-Jul-08	17.97	30.9	25.7	16.0
Southern Indian Lake (Area 4)	GN-06	14	533961	6364346	24-Jul-08	18.47	16.7	8.1	17.0
Southern Indian Lake (Area 4)	GN-07	14	531399	6365708	24-Jul-08	19.17	17.4	15.6	17.3
Southern Indian Lake (Area 4)	GN-08	14	530657	6369731	24-Jul-08	19.63	13.1	12.9	17.4
Southern Indian Lake (Area 4)	GN-09	14	533770	6371217	26-Jul-08	22.88	13.3	13.2	17.8
Southern Indian Lake (Area 4)	GN-10	14	537243	6368027	26-Jul-08	21.50	11.6	13.4	17.4
Southern Indian Lake (Area 4)	GN-11	14	538208	6366210	26-Jul-08	19.22	9.1	6.0	15.8
Southern Indian Lake (Area 4)	GN-12	14	542154	6363938	26-Jul-08	17.18	20.4	20.6	15.4
Southern Indian Lake (Area 4)	GN-13	14	531189	6359290	26-Jul-08	17.92	20.8	21.0	15.8
Southern Indian Lake (Area 4)	GN-14	14	534543	6356161	26-Jul-08	18.42	17.5	18.2	15.5
Southern Indian Lake (Area 4)	GN-15	14	534511	6350634	26-Jul-08	19.33	18.2	19.4	14.9

Table 5.3.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Southern Indian Lake (Area 4)	GN-16	14	526131	6345042	28-Jul-08	22.22	16.8	17.1	14.5
Southern Indian Lake (Area 4)	GN-17	14	525779	6339304	28-Jul-08	22.67	20.7	19.8	14.2
Southern Indian Lake (Area 4)	GN-18	14	529683	6338614	28-Jul-08	20.73	-	19.7	-
Southern Indian Lake (Area 4)	GN-19	14	533161	6338337	28-Jul-08	21.08	19.8	19.8	13.8
Southern Indian Lake (Area 4)	GN-20	14	542786	6338209	27-Jul-08	17.37	15.8	17.6	17.3
Southern Indian Lake (Area 4)	GN-21	14	537367	6343772	27-Jul-08	15.03	18.9	18.8	18.1
Southern Indian Lake (Area 4)	GN-22	14	540279	6345038	24-Jul-08	18.10	20.8	20.9	14.1
Southern Indian Lake (Area 4)	GN-23	14	540360	6347989	24-Jul-08	17.17	12.4	17.9	14.7
Southern Indian Lake (Area 4)	GN-24	14	541062	6353125	24-Jul-08	16.70	10.0	13.6	14.2
Southern Indian Lake (Area 4)	GN-25	14	538070	6338692	27-Jul-08	16.60	18.2	18.5	18.2
Southern Indian Lake (Area 4)	SN-01	14	548005	6357053	23-Jul-08	16.70	8.4	6.0	17.8
Southern Indian Lake (Area 4)	SN-06	14	533961	6364346	24-Jul-08	18.47	16.7	8.1	17.0
Southern Indian Lake (Area 4)	SN-15	14	534511	6350634	26-Jul-08	19.33	18.2	19.4	14.9
Southern Indian Lake (Area 4)	SN-18	14	529683	6338614	28-Jul-08	20.73	-	19.7	-
Southern Indian Lake (Area 4)	SN-20	14	542786	6338209	27-Jul-08	17.37	15.8	17.6	17.3
Southern Indian Lake (Area 4)	SN-21	14	537367	6343772	27-Jul-08	15.03	18.9	18.8	18.1
Southern Indian Lake (Area 4)	GN-01	14	548163	6357169	7-Aug-09	17.00	6.6	-	17.7
Southern Indian Lake (Area 4)	GN-02	14	542809	6358537	7-Aug-09	16.55	14.1	-	17.2
Southern Indian Lake (Area 4)	GN-04	14	542453	6360030	7-Aug-09	17.80	21.5	-	18.1
Southern Indian Lake (Area 4)	GN-05	14	537415	6362855	8-Aug-09	22.50	25.7	-	15.8
Southern Indian Lake (Area 4)	GN-06	14	538208	6366208	7-Aug-09	16.50	11.6	13.4	15.8
Southern Indian Lake (Area 4)	GN-07	14	533961	6364346	7-Aug-09	21.83	9.1	6.0	17.0
Southern Indian Lake (Area 4)	GN-08	14	531399	6365708	6-Aug-09	20.42	16.7	8.1	17.3
Southern Indian Lake (Area 4)	GN-09	14	530657	6369731	8-Aug-09	19.67	17.4	15.6	17.4
Southern Indian Lake (Area 4)	GN-10	14	533770	6371217	8-Aug-09	21.00	13.1	12.9	17.8
Southern Indian Lake (Area 4)	GN-11	14	537243	6368027	7-Aug-09	16.67	13.3	13.2	17.4
Southern Indian Lake (Area 4)	GN-12	14	542154	6363938	7-Aug-09	18.43	20.4	20.6	15.4
Southern Indian Lake (Area 4)	GN-13	14	531189	6359290	9-Aug-09	19.83	20.8	21.0	15.8
Southern Indian Lake (Area 4)	GN-14	14	534543	6356161	9-Aug-09	20.67	17.5	18.2	115.5
Southern Indian Lake (Area 4)	GN-15	14	534504	6350533	9-Aug-09	19.92	-	-	-

Table 5.3.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Southern Indian Lake (Area 4)	GN-16	14	526131	6345042	18-Sep-09	18.67	19.8	19.5	14.5
Southern Indian Lake (Area 4)	GN-17	14	525779	6339304	18-Sep-09	19.25	18.9	18.8	14.2
Southern Indian Lake (Area 4)	GN-18	14	529683	6338614	18-Sep-09	17.38	18.2	18.5	-
Southern Indian Lake (Area 4)	GN-19	14	533161	6338337	18-Sep-09	16.62	15.8	17.6	13.8
Southern Indian Lake (Area 4)	GN-20	14	542786	6338209	17-Sep-09	19.42	16.8	17.1	17.3
Southern Indian Lake (Area 4)	GN-21	14	537367	6343772	17-Sep-09	15.83	-	19.7	18.1
Southern Indian Lake (Area 4)	GN-22	14	540279	6345038	8-Aug-09	25.92	20.8	20.9	14.1
Southern Indian Lake (Area 4)	GN-23	14	540360	6347989	8-Aug-09	24.57	12.4	17.9	14.7
Southern Indian Lake (Area 4)	GN-24	14	541062	6353125	8-Aug-09	24.35	10.0	13.6	14.2
Southern Indian Lake (Area 4)	GN-25	14	538070	6338692	17-Sep-09	18.42	20.7	19.8	17.7
Southern Indian Lake (Area 4)	SN-07	14	531399	6365708	8-Aug-09	20.42	17.4	15.6	17.3
Southern Indian Lake (Area 4)	SN-10	14	537243	6368027	7-Aug-09	16.67	11.6	13.4	17.4
Southern Indian Lake (Area 4)	SN-15	14	534504	6350533	9-Aug-09	19.92	-	-	-
Southern Indian Lake (Area 4)	GN-01	14	548098	6357076	19-Sep-10	20.72	13.7	6.6	6.4
Southern Indian Lake (Area 4)	GN-02	14	542837	6358657	19-Sep-10	22.17	12.3	17.0	6.9
Southern Indian Lake (Area 4)	GN-03	14	543452	6360862	19-Sep-10	23.40	12.7	16.2	7.1
Southern Indian Lake (Area 4)	GN-04	14	542546	6360352	22-Sep-10	19.43	22.6	21.5	9.9
Southern Indian Lake (Area 4)	GN-05	14	537511	6362781	21-Sep-10	24.42	28.4	25.2	6.0
Southern Indian Lake (Area 4)	GN-07	14	531297	6366069	21-Sep-10	21.98	6.7	6.8	6.0
Southern Indian Lake (Area 4)	GN-09	14	533673	6371159	20-Sep-10	22.25	15.3	16.0	5.0
Southern Indian Lake (Area 4)	GN-11	14	538238	6366562	20-Sep-10	21.88	2.7	4.5	5.0
Southern Indian Lake (Area 4)	GN-12	14	542057	6363950	20-Sep-10	21.67	20.0	21.4	5.0
Southern Indian Lake (Area 4)	GN-13	14	531213	6359406	21-Sep-10	21.10	20.1	21.9	6.0
Southern Indian Lake (Area 4)	GN-14	14	534563	6356038	21-Sep-10	22.50	17.2	17.1	9.9
Southern Indian Lake (Area 4)	GN-15	14	534479	6350515	21-Sep-10	22.18	19.4	18.9	9.7
Southern Indian Lake (Area 4)	GN-16	14	526121	6345049	20-Sep-10	22.40	17.2	17.1	9.8
Southern Indian Lake (Area 4)	GN-18	14	529785	6338701	20-Sep-10	22.25	11.0	20.7	9.7
Southern Indian Lake (Area 4)	GN-19	14	533072	6338372	20-Sep-10	22.00	20.2	20.2	9.6
Southern Indian Lake (Area 4)	GN-21	14	537315	6343724	19-Sep-10	22.92	21.9	22.0	9.7
Southern Indian Lake (Area 4)	GN-23	14	540311	6347912	19-Sep-10	22.67	16.3	16.3	9.8

Table 5.3.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (°C)
		Zone	Easting	Northing			Start	End	
Southern Indian Lake (Area 4)	GN-24	14	541122	6353116	21-Sep-10	22.70	9.8	4.7	9.9
Southern Indian Lake (Area 4)	GN-25	14	538076	6338650	19-Sep-10	23.20	19.1	19.1	9.7
Southern Indian Lake (Area 4)	GN-26	14	543413	6360848	22-Sep-10	18.55	13.3	16.8	9.3
Southern Indian Lake (Area 4)	GN-27	14	542293	6361361	22-Sep-10	19.12	19.5	18.5	9.7
Southern Indian Lake (Area 4)	SN-01	14	548098	6357076	19-Sep-10	20.72	13.7	6.6	6.4
Southern Indian Lake (Area 4)	SN-07	14	531297	6366069	21-Sep-10	21.98	6.7	6.8	6.0
Southern Indian Lake (Area 4)	SN-09	14	533673	6371159	20-Sep-10	22.25	15.3	16.0	5.0
Southern Indian Lake (Area 4)	SN-24	14	541122	6353116	21-Sep-10	22.70	9.8	4.7	9.9
Southern Indian Lake (Area 4)	SN-25	14	538076	6338650	19-Sep-10	23.20	19.1	19.1	9.7
Gauer Lake	GN-01	14	570993	6307763	25-Jul-08	21.85	1.8	5.6	17.0
Gauer Lake	GN-02	14	567110	6308585	25-Jul-08	44.73	6.4	7.2	17.0
Gauer Lake	GN-03	14	564457	6312455	25-Jul-08	25.32	1.6	1.5	17.0
Gauer Lake	GN-04	14	568015	6310555	26-Jul-08	26.50	1.0	4.7	17.5
Gauer Lake	GN-05	14	571365	6314613	27-Jul-08	23.92	21.5	22.8	22.0
Gauer Lake	GN-06	14	568168	6314278	27-Jul-08	17.80	5.1	3.8	22.0
Gauer Lake	GN-07	14	568602	6311778	28-Jul-08	47.33	9.1	5.1	18.5
Gauer Lake	GN-08	14	566588	6317104	28-Jul-08	25.00	2.6	2.3	19.0
Gauer Lake	GN-09	14	562503	6310057	29-Jul-08	24.70	3.2	2.8	19.0
Gauer Lake	SN-03	14	564476	6312494	25-Jul-08	25.40	1.3	1.6	17.0
Gauer Lake	SN-05	14	571365	6314613	27-Jul-08	23.83	18.0	21.5	22.0
Gauer Lake	SN-09	14	562544	6310065	29-Jul-08	26.17	3.2	3.2	19.0
Gauer Lake	GN-01	14	570865	6307811	24-Jul-09	23.25	6.6	2.3	16.0
Gauer Lake	GN-02	14	567193	6308674	24-Jul-09	24.00	3.0	8.9	16.0
Gauer Lake	GN-03	14	564412	6312314	25-Jul-09	22.00	1.4	2.7	17.0
Gauer Lake	GN-04	14	567909	6310496	23-Jul-09	16.92	5.9	1.7	14.0
Gauer Lake	GN-05	14	571301	6314698	27-Jul-09	18.58	23.6	24.4	16.0
Gauer Lake	GN-06	14	568145	6314312	26-Jul-09	28.50	3.3	5.9	17.0
Gauer Lake	GN-07	14	568509	6311651	25-Jul-09	23.00	15.1	8.4	15.0
Gauer Lake	GN-08	14	566554	6316951	27-Jul-09	19.83	3.5	2.4	16.0
Gauer Lake	GN-09	14	562528	6309951	26-Jul-09	26.08	1.7	2.1	19.0

Table 5.3.7-1. continued.

Location	Site	UTM Coordinates			Set Date	Set Duration (h)	Water Depth (m)		Water Temperature (ºC)
		Zone	Easting	Northing			Start	End	
Gauer Lake	SN-03	14	564412	6312314	25-Jul-09	22.00	1.4	2.7	17.0
Gauer Lake	SN-05	14	571301	6314698	27-Jul-09	18.58	23.6	24.4	16.0
Gauer Lake	SN-09	14	562528	6309951	26-Jul-09	26.08	1.7	2.1	19.0
Gauer Lake	GN-01	14	570828	6307756	14-Jul-10	45.07	1.0	6.5	18.5
Gauer Lake	GN-02	14	567206	6308669	14-Jul-10	24.20	6.0	7.0	18.0
Gauer Lake	GN-03	14	564469	6312317	17-Jul-10	22.25	2.0	1.0	18.0
Gauer Lake	GN-04	14	567874	6310483	14-Jul-10	46.23	2.0	6.0	17.5
Gauer Lake	GN-05	14	571226	6314682	16-Jul-10	20.27	25.0	24.0	18.0
Gauer Lake	GN-06	14	568189	6314213	16-Jul-10	22.88	5.5	4.5	18.0
Gauer Lake	GN-07	14	568537	6311638	14-Jul-10	45.47	3.5	13.5	18.0
Gauer Lake	GN-08	14	566594	6317087	16-Jul-10	20.33	3.0	1.0	18.0
Gauer Lake	GN-09	14	562378	6309862	17-Jul-10	21.02	1.0	3.5	18.0
Gauer Lake	SN-03	14	564469	6312317	17-Jul-10	22.25	2.0	1.0	18.0
Gauer Lake	SN-05	14	571226	6314682	16-Jul-10	20.27	25.0	24.0	18.0
Gauer Lake	SN-09	14	562378	6309862	17-Jul-10	21.02	1.0	1.0	18.0

Table 5.3.7-2. Fish species list compiled from standard gang and small mesh index gillnetting conducted in Upper Churchill River Region waterbodies, 2008-2010.

Family	Common Name	Scientific Name	ID Code	Captured in Region		
				2008	2009	2010
Cyprinidae	Lake Chub	*Couesius plumbeus*	LKCH	+	+	+
	Emerald Shiner	*Notropis atherinoides*	EMSH	+	+	+
	Spottail Shiner	*Notropis hudsonius*	SPSH	+	+	+
Catostomidae	Longnose Sucker	*Catostomus catostomus*	LNSC	+	+	+
	White Sucker	*Catostomus commersoni*	WHSC	+	+	+
	Shorthead Redhorse	*Moxostoma macrolepidotum*	SHRD		+	+
Esocidae	Northern Pike	*Esox lucius*	NRPK	+	+	+
Salmonidae	Cisco	*Coregonus artedi*	CISC	+	+	+
	Lake Whitefish	*Coregonus clupeaformis*	LKWH	+	+	+
Percopsidae	Troutperch	*Percopsis omiscomaycus*	TRPR	+	+	+
Gadidae	Burbot	*Lota lota*	BURB	+	+	+
Cottidae	Slimy Sculpin	*Cottus bairdi*	SLSC	+	+	+
Percidae	Yellow Perch	*Perca flavescens*	YLPR	+	+	+
	Logperch	*Percina shumardi*	LGPR	+	+	
	Sauger	*Sander canadensis*	SAUG	+	+	+
	Walleye	*Sander vitreus*	WALL	+	+	+

Table 5.3.7-3. Standard gang index gillnet relative abundance summaries from Upper Churchill River Region waterbodies, 2008-2010.

Species	Granville Lake								SIL-Area 1		SIL-Area 6	
	2008		2009		2010		Overall		2009		2010	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	13	1.37	40	4.51	15	1.61	68	2.46	34	11.04	25	5.91
White Sucker	593	62.62	530	59.75	567	60.71	1690	61.05	24	7.79	42	9.93
Shorthead Redhorse	-	-	5	0.56	4	0.43	9	0.33	-	-	-	-
Northern Pike	52	5.49	40	4.51	44	4.71	136	4.91	43	13.96	26	6.15
Cisco	22	2.32	18	2.03	29	3.10	69	2.49	48	15.58	132	31.21
Lake Whitefish	21	2.22	67	7.55	49	5.25	137	4.95	63	20.45	28	6.62
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	27	2.85	22	2.48	9	0.96	58	2.10	43	13.96	9	2.13
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	31	3.27	22	2.48	12	1.28	65	2.35	1	0.32	2	0.47
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	102	10.77	135	15.22	54	5.78	291	10.51	40	12.99	154	36.41
Walleye	86	9.08	8	0.90	151	16.17	245	8.85	12	3.90	5	1.18
Total	947	100	887	100	934	100	2768	100	308	100	423	100

n = number of fish caught and RA = percent relative abundance

Table 5.3.7-3. continued.

Species	SIL-Area 4								Gauer Lake							
	2008		2009		2010		Overall		2008		2009		2010		Overall	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	438	23.36	407	34.40	267	34.86	1112	29.08	19	2.14	16	2.83	16	2.23	51	2.35
White Sucker	12	0.64	1	0.08	7	0.91	20	0.52	255	28.75	171	30.27	178	24.86	604	27.86
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	167	8.91	102	8.62	55	7.18	324	8.47	126	14.21	80	14.16	122	17.04	328	15.13
Cisco	429	22.88	256	21.64	161	21.02	846	22.12	64	7.22	14	2.48	12	1.68	90	4.15
Lake Whitefish	632	33.71	261	22.06	174	22.72	1067	27.90	212	23.90	105	18.58	172	24.02	489	22.56
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	195	10.40	155	13.10	88	11.49	438	11.45	34	3.83	6	1.06	3	0.42	43	1.98
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	-	-	48	5.41	42	7.43	26	3.63	116	5.35
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	2	0.11	1	0.08	2	0.26	5	0.13	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	12	1.57	12	0.31	129	14.54	131	23.19	187	26.12	447	20.62
Total	1875	100	1183	100	766	100	3824	100	887	100	565	100	716	100	2168	100

n = number of fish caught and RA = percent relative abundance

Table 5.3.7-4. Standard gang index gillnet biomass summaries from Upper Churchill River Region waterbodies, 2008-2010 (and overall).

Species	Granville Lake												SIL-Area 1		
	2008			2009			2010			Overall			2009		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	13	15610	1.75	40	52120	6.93	15	20010	2.58	68	87740	3.62	34	48260	20.21
White Sucker	593	707160	79.12	530	505020	67.12	567	535700	69.10	1690	1747880	72.18	24	13590	5.69
Shorthead Redhorse	-	-	-	5	2590	0.34	4	2400	0.31	9	4990	0.21	-	-	-
Northern Pike	52	58730	6.57	40	50690	6.74	44	74200	9.57	136	183620	7.58	43	42670	17.87
Cisco	22	7010	0.78	18	5540	0.74	29	9530	1.23	69	22080	0.91	48	21520	9.01
Lake Whitefish	21	10650	1.19	67	62295	8.28	49	28470	3.67	137	101415	4.19	63	61960	25.95
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	27	23610	2.64	22	41880	5.57	9	8410	1.08	58	73900	3.05	43	37790	15.83
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	31	2590	0.29	22	2030	0.27	12	1140	0.15	65	5760	0.24	1	120	0.05
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	102	16900	1.89	135	24860	3.30	54	10300	1.33	291	52060	2.15	40	5820	2.44
Walleye	86	51530	5.77	8	5400	0.72	151	85090	10.98	245	142020	5.87	12	7050	2.95
Total	947	893790	100	887	752425	100	934	775250	100	2768	2421465	100	308	238780	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = percent of total biomass

Table 5.3.7-4. continued.

Species	SIL-Area 6			SIL-Area 4											
	2010			2008			2009			2010			Overall		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	25	35310	17.55	438	317330	26.16	407	326470	41.00	267	225260	46.43	1112	869060	34.84
White Sucker	42	40370	20.07	12	5050	0.42	1	120	0.02	7	8630	1.78	20	13800	0.55
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	26	25300	12.58	167	206400	17.02	102	123272	15.48	55	71600	14.76	324	401272	16.09
Cisco	132	45870	22.81	429	138980	11.46	256	73210	9.19	161	29870	6.16	846	242060	9.70
Lake Whitefish	28	16000	7.95	632	348718	28.75	261	132514	16.64	174	79660	16.42	1067	560892	22.49
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	9	8300	4.13	195	195710	16.14	155	140350	17.63	88	62910	12.97	438	398970	15.99
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	2	190	0.09	-	-	-	-	-	-	-	-	-	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	154	27380	13.61	2	760	0.06	1	370	0.05	2	600	0.12	5	1730	0.07
Walleye	5	2420	1.20	-	-	-	-	-	-	12	6590	1.36	12	6590	0.26
Total	423	201140	100	1875	1212948	100	1183	796306	100	766	485120	100	3824	2494374	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = percent of total biomass

Table 5.3.7-4. continued.

Species	Gauer Lake											
	2008			2009			2010			Overall		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	19	19310	2.29	16	14010	2.70	16	14345	2.17	51	47665	2.36
White Sucker	255	331670	39.34	171	200280	38.66	178	236237	35.70	604	768187	37.98
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	126	178910	21.22	80	105540	20.37	122	156893	23.71	328	441343	21.82
Cisco	64	17290	2.05	14	4520	0.87	12	2526	0.38	90	24336	1.20
Lake Whitefish	212	157580	18.69	105	87206	16.83	172	114795	17.35	489	359581	17.78
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	34	41040	4.87	6	6650	1.28	3	4797	0.72	43	52487	2.59
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	48	8100	0.96	42	8010	1.55	26	4578	0.69	116	20688	1.02
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	129	89090	10.57	131	91852	17.73	187	127642	19.29	447	308584	15.25
Total	887	842990	100	565	518068	100	716	661813	100	2168	2022871	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = percent of total biomass

Table 5.3.7-5. Small mesh index gillnet relative abundance summaries from Upper Churchill River Region waterbodies, 2008-2010.

Species	Granville Lake								SIL-Area 1		SIL-Area 6	
	2008		2009		2010		Overall		2009		2010	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	36	13.85	5	2.56	32	11.03	73	9.80	-	-	11	6.15
Spottail Shiner	41	15.77	31	15.90	63	21.72	135	18.12	-	-	1	0.56
Longnose Sucker	-	-	-	-	1	0.34	1	0.13	-	-	-	-
White Sucker	-	-	4	2.05	1	0.34	5	0.67	-	-	-	-
Shorthead Redhorse	-	-	-	-	1	0.34	1	0.13	-	-	-	-
Northern Pike	-	-	3	1.54	2	0.69	5	0.67	-	-	2	1.12
Cisco	23	8.85	4	2.05	91	31.38	118	15.94	-	-	40	22.35
Lake Whitefish	-	-	2	1.03	-	-	2	0.27	1	33.33	1	0.56
Troutperch	8	3.08	96	49.23	6	2.07	110	14.77	1	33.33	36	20.11
Burbot	1	0.38	-	-	-	-	1	0.13	-	-	-	-
Slimy Sculpin	-	-	-	-	1	0.34	1	0.13	1	33.33	-	-
Yellow Perch	57	21.92	21	10.77	61	21.03	139	18.66	-	-	-	-
Logperch	-	-	3	1.54	-	-	3	0.40	-	-	-	-
Sauger	94	36.15	24	12.31	24	8.28	142	19.06	-	-	86	48.04
Walleye	-	-	2	1.03	7	2.41	9	1.21	-	-	2	1.12
Total	260	100	195	100	290	100	745	100	3	100	179	100

n = number of fish caught and RA = percent relative abundance

Table 5.3.7-5. continued.

Species	SIL-Area 4								Gauer Lake							
	2008		2009		2010		Overall		2008		2009		2010		Overall	
	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)	n	RA (%)
Lake Chub	-	-	-	-	-	-	-	-	9	1.72	1	0.37	7	2.36	17	1.56
Emerald Shiner	-	-	-	-	-	-	-	-	15	2.87	-	-	126	42.42	141	12.92
Spottail Shiner	-	-	-	-	6	14.29	6	5.00	335	64.18	143	52.57	52	17.51	530	48.58
Longnose Sucker	3	4.62	1	7.69	1	2.38	5	4.17	-	-	1	0.37	1	0.34	2	0.18
White Sucker	-	-	-	-	-	-	-	-	8	1.53	1	0.37	-	-	9	0.82
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	1	1.54	-	-	-	-	1	0.83	8	1.53	18	6.62	8	2.69	34	3.12
Cisco	49	75.38	3	23.08	28	66.67	80	66.67	3	0.57	-	-	-	-	3	0.27
Lake Whitefish	1	1.54	3	23.08	-	-	4	3.33	9	1.72	4	1.47	11	3.70	24	2.20
Troutperch	4	6.15	3	23.08	1	2.38	8	6.67	70	13.41	49	18.01	59	19.87	178	16.32
Burbot	-	-	3	23.08	1	2.38	4	3.33	5	0.96	-	-	-	-	5	0.46
Slimy Sculpin	6	9.23	-	-	-	-	6	5.00	-	-	-	-	-	-	-	-
Yellow Perch	-	-	-	-	-	-	-	-	38	7.28	23	8.46	6	2.02	67	6.14
Logperch	-	-	-	-	-	-	-	-	1	0.19	-	-	-	-	1	0.09
Sauger	1	1.54	-	-	4	9.52	5	4.17	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	1	2.38	1	0.83	21	4.02	32	11.76	27	9.09	80	7.33
Total	65	100	13	100	42	100	120	100	522	100	272	100	297	100	1091	100

n = number of fish caught and RA = percent relative abundance

Table 5.3.7-6. Small mesh index gillnet biomass summaries from Upper Churchill River Region waterbodies, 2008-2010 (and overall).

Species	Granville Lake												SIL-Area 1		
	2008			2009			2010			Overall			2009		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	36	160	1.77	5	22	0.19	32	124	1.12	73	306	0.96	-	-	-
Spottail Shiner	41	200	2.21	31	46	0.39	63	344	3.09	135	590	1.84	-	-	-
Longnose Sucker	-	-	-	-	-	-	1	19	0.17	1	19	0.06	-	-	-
White Sucker	-	-	-	4	2520	21.31	1	31	0.28	5	2551	7.98	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	1	410	3.69	1	410	1.28	-	-	-
Northern Pike	-	-	-	3	2490	21.06	2	2290	20.60	5	4780	14.95	-	-	-
Cisco	23	380	4.20	4	310	2.62	91	1770	15.92	118	2460	7.69	-	-	-
Lake Whitefish	-	-	-	2	1330	11.25	-	-	-	2	1330	4.16	1	190	89.62
Troutperch	8	80	0.88	96	462	3.91	6	29	0.26	110	571	1.79	1	17	8.02
Burbot	1	260	2.88	-	-	-	-	-	-	1	260	0.81	-	-	-
Slimy Sculpin	-	-	-	-	-	-	1	2	0.02	1	2	0.01	1	5	2.36
Yellow Perch	57	830	9.18	21	132	1.12	61	1088	9.79	139	2050	6.41	-	-	-
Logperch	-	-	-	3	8	0.07	-	-	-	3	8	0.03	-	-	-
Sauger	94	7130	78.87	24	3055	25.84	24	2917	26.24	142	13102	40.97	-	-	-
Walleye	-	-	-	2	1450	12.26	7	2094	18.83	9	3544	11.08	-	-	-
Total	260	9040	100	195	11825	100	290	11118	100	745	31983	100	3	212	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = percent of total biomass

Table 5.3.7-6. continued.

Species	SIL-Area 6			SIL-Area 4											
	2010			2008			2009			2010			Overall		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	11	43	0.27	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	1	9	0.06	-	-	-	-	-	-	6	40	0.79	6	40	0.29
Longnose Sucker	-	-	-	3	1060	23.66	1	100	2.27	1	10	0.20	5	1170	8.37
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	2	2340	14.53	1	1210	27.01	-	-	-	-	-	-	1	1210	8.66
Cisco	40	1870	11.61	49	1280	28.57	3	200	4.54	28	3651	71.86	80	5131	36.73
Lake Whitefish	1	370	2.30	1	730	16.29	3	1280	29.02	-	-	-	4	2010	14.39
Troutperch	36	218.1	1.35	4	60	1.34	3	50	1.13	1	10	0.20	8	120	0.86
Burbot	-	-	-	-	-	-	3	2780	63.04	1	470	9.25	4	3250	23.26
Slimy Sculpin	-	-	-	6	40	0.89	-	-	-	-	-	-	6	40	0.29
Yellow Perch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	86	9900	61.45	1	100	2.23	-	-	-	4	190	3.74	5	290	2.08
Walleye	2	1360	8.44	-	-	-	-	-	-	1	710	13.97	1	710	5.08
Total	179	16110	100	65	4480	100	13	4410	100	42	5081	100	120	13971	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = percent of total biomass

Table 5.3.7-6. continued.

Species	Gauer Lake											
	2008			2009			2010			Overall		
	n	B (g)	%	n	B (g)	%	n	B (g)	%	n	B (g)	%
Lake Chub	9	55	0.33	1	10	0.04	7	44	0.19	17	109	0.16
Emerald Shiner	15	77	0.47	-	-	-	126	388	1.68	141	465	0.70
Spottail Shiner	335	1360	8.21	143	600	2.20	52	196	0.85	530	2156	3.22
Longnose Sucker	-	-	-	1	520	1.91	1	205	0.89	2	725	1.08
White Sucker	8	110	0.66	1	15	0.06	-	-	-	9	125	0.19
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	8	4950	29.90	18	14920	54.79	8	11207	48.52	34	31077	46.46
Cisco	3	390	2.36	-	-	-	-	-	-	3	390	0.58
Lake Whitefish	9	3580	21.62	4	1750	6.43	11	3497	15.14	24	8827	13.20
Troutperch	70	340	2.05	49	235	0.86	59	245	1.06	178	820	1.23
Burbot	5	25	0.15	-	-	-	-	-	-	5	25	0.04
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	38	380	2.30	23	1100	4.04	6	216	0.94	67	1696	2.54
Logperch	1	10	0.06	-	-	-	-	-	-	1	10	0.01
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	21	5280	31.89	32	8080	29.67	27	7101	30.74	80	20461	30.59
Total	522	16557	100	272	27230	100	297	23099	100	1091	66886	100

n = number of fish measured (may not equal number of fish caught); B = biomass (g); and % = percent of total biomass

Table 5.3.7-7. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in standard gang index gill nets (fish/100 m/24 h) set in Upper Churchill River Region waterbodies, 2008-2010 (and overall).

Species	Granville Lake												SIL-Area 1		
	2008 (#sites=12)			2009 (#sites=12)			2010 (#sites=12)			Overall (#years=3)			2009 (#sites=12)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE	n	CPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	13	1.2	1.47	40	3.3	6.98	15	1.3	2.28	68	1.9	0.70	34	3.6	5.18
White Sucker	593	54.0	34.19	530	43.9	27.16	567	46.4	22.66	1690	48.1	3.04	24	2.5	2.61
Shorthead Redhorse	-	-	-	5	0.4	0.85	4	0.3	0.66	9	0.2	0.12	-	-	-
Northern Pike	52	4.5	2.51	40	3.3	2.89	44	3.6	1.52	136	3.8	0.35	43	4.4	7.79
Cisco	22	1.8	2.06	18	1.4	2.22	29	2.4	3.40	69	1.9	0.28	48	5.1	6.56
Lake Whitefish	21	2.0	2.81	67	5.7	10.04	49	4.2	5.28	137	4.0	1.06	63	6.7	7.18
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	27	2.3	5.26	22	1.9	2.37	9	0.8	1.10	58	1.6	0.46	43	4.5	3.30
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	31	2.6	2.58	22	1.7	2.04	12	1.0	1.06	65	1.8	0.46	1	0.1	0.35
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	102	9.1	5.24	135	11.2	8.24	54	4.7	4.86	291	8.3	1.92	40	4.1	6.68
Walleye	86	1.4	13.35	8	0.7	1.32	151	11.9	15.63	245	4.7	3.61	12	1.2	2.79
Total	947	85.9	37.95	887	73.5	23.68	934	76.6	21.67	2768	78.6	3.71	308	32.2	13.10

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught

mean catch per unit effort per site (2008, 2009 and 2010) and per year (overall)

SD = standard deviation; SE = standard error

Table 5.3.7-7. continued.

Species	SIL-Area 6			SIL-Area 4											
	2010 (#sites=12)			2008 (#sites=25)			2009 (#sites=24)			2010 (#sites=21)			Overall (#years=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	25	2.1	2.27	438	19.5	16.44	407	18.9	14.23	267	12.3	6.35	1112	16.9	2.31
White Sucker	42	3.4	1.99	12	0.6	2.27	1	0.1	0.22	7	0.3	1.26	20	0.3	0.15
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	26	2.1	2.48	167	7.3	9.82	102	4.7	6.29	55	2.6	5.29	324	4.8	1.36
Cisco	132	11.4	11.25	429	19.7	19.34	256	12.0	13.96	161	7.3	12.91	846	13.0	3.62
Lake Whitefish	28	2.4	1.45	632	28.2	21.41	261	11.8	8.52	174	7.9	5.04	1067	16.0	6.21
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	9	0.8	1.39	195	9.1	6.98	155	7.2	6.08	88	4.0	3.38	438	6.8	1.47
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	2	0.2	0.41	-	-	-	-	-	-	-	-	-	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	154	12.8	9.81	2	0.1	0.33	1	0.1	0.22	2	0.1	0.28	5	0.1	0.02
Walleye	5	0.4	0.89	-	-	-	-	-	-	12	0.6	1.73	12	0.2	0.18
Total	423	35.6	18.05	1875	84.4	29.99	1183	54.5	25.48	766	35.1	19.28	3824	58.0	14.35

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught

CPUE = mean catch per unit effort (fish/100 m/24 h) per site (2008, 2009 and 2010) and per year (overall)

SD = standard deviation; SE = standard error

Table 5.3.7-7. continued.

Species	Gauer Lake											
	2008 (#sites=9)			2009 (#sites=9)			2010 (#sites=9)			Overall (#years=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	19	1.4	2.94	16	1.7	2.50	16	1.4	3.05	51	1.5	0.10
White Sucker	255	23.2	15.00	171	18.1	11.03	178	14.9	9.33	604	18.7	2.40
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	126	10.8	7.27	80	8.3	3.48	122	10.2	7.67	328	9.8	0.76
Cisco	64	5.5	5.33	14	1.6	2.95	12	1.0	1.03	90	2.7	1.43
Lake Whitefish	212	20.1	11.35	105	11.5	5.80	172	15.1	8.85	489	15.6	2.52
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	34	3.3	9.95	6	0.7	1.87	3	0.3	0.69	43	1.4	0.95
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	48	4.3	6.54	42	4.1	7.54	26	2.8	4.42	116	3.7	0.49
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	129	11.2	8.48	131	14.0	11.84	187	15.3	4.16	447	13.5	1.23
Total	887	79.9	25.72	565	59.9	26.13	716	61.1	16.51	2168	66.9	6.47

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/100 m/24 h) per site (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.3.7-8. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in standard gang index gill nets (g/100 m/24 h) set in Upper Churchill River Region waterbodies, 2008-2010 (and overall).

Species	Granville Lake												SIL-Area 1		
	2008 (#sites=12)			2009 (#sites=12)			2010 (#sites=12)			Overall (#years=3)			2009 (#sites=12)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE	n	BPUE	SD
Lake Chub	-	-		-	-		-	-		-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	13	1506	2599	40	4303	9756	15	1655	3215	68	2488	909	34	5159	7765
White Sucker	593	62876	45158	530	41850	28372	567	44099	25345	1690	49609	6665	24	1396	1464
Shorthead Redhorse	-	-	-	5	210	390	4	199	362	9	137	68	-	-	-
Northern Pike	52	5061	3664	40	4223	3586	44	6130	3452	136	5138	552	43	4727	7940
Cisco	22	583	790	18	452	597	29	773	1330	69	603	93	48	2295	2847
Lake Whitefish	21	981	1226	67	5318	11304	49	2462	3422	137	2920	1273	63	6664	8607
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	27	1942	3529	22	3329	4755	9	688	1061	58	1986	763	43	3961	2864
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	31	216	236	22	158	182	12	97	108	65	157	34	1	12	42
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	102	1480	928	135	2068	1612	54	880	1081	291	1476	343	40	596	920
Walleye	86	5006	7506	8	504	966	151	6832	7093	245	4114	1880	12	701	1641
Total	947	79650	41349	887	62417	20656	934	63815	23946	2768	68627	5526	308	25511	11660

#sites = number of sites sampled; #years = number of years sampled; n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/100 m/24 h) per site (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.3.7-8. continued.

Species	SIL-Area 6			SIL-Area 4											
	2010 (#sites=12)			2008 (#sites=25)			2009 (#sites=24)			2010 (#sites=21)			Overall (#years=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	25	2889	3361	438	13876	16220	407	15134	14246	267	10373	6083	1112	13127	1424
White Sucker	42	3286	2200	12	230	817	1	5	27	7	394	1442	20	210	113
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	26	2123	2415	167	8985	12018	102	5892	7942	55	3452	7177	324	6109	1601
Cisco	132	3962	4195	429	6422	7622	256	3411	4033	161	1355	2392	846	3729	1471
Lake Whitefish	28	1332	827	632	15567	12125	261	6915	5922	174	3641	2474	1067	8707	3558
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	9	730	1235	195	9159	7456	155	6484	5252	88	2873	2519	438	6172	1821
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	2	17	39	-	-	-	-	-	-	-	-	-	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	154	2291	1927	2	36	127	1	17	82	2	27	89	4	21	11
Walleye	5	202	437	-	-	-	-	-	-	12	304	845	12	101	101
Total	423	16834	6036	1875	54276	23386	1183	37856	21028	766	22418	12623	3824	38183	9198

#sites = number of sites sampled; #years = number of years sampled; n = number of fish measured (may not equal number of fish caught)

BPUE = mean biomass per unit effort (g/100 m/24 h) per site (2008, 2009 and 2010) and per year (overall)

SD = standard deviation; SE = standard error

Table 5.3.7-8. continued.

Species	Gauer Lake											
	2008 (#sites=9)			2009 (#sites=9)			2010 (#sites=9)			Overall (#years=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	-	-	-	-	-	-	-	-	-	-	-	-
Longnose Sucker	19	1191	2215	16	1443	1828	16	1104	2055	51	1246	102
White Sucker	255	29769	19332	171	21199	12364	178	19350	12708	604	23439	3209
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	126	15104	8983	80	11109	5665	122	12671	9724	328	12961	1162
Cisco	64	1527	1864	14	493	766	12	189	247	90	737	405
Lake Whitefish	212	14983	9393	105	9503	4884	172	10301	6954	489	11596	1709
Troutperch	-	-	-	-	-	-	-	-	-	-	-	-
Burbot	34	4003	12009	6	824	2404	3	414	980	43	1747	1134
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	48	705	1010	42	779	1437	26	475	740	116	653	91
Logperch	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	129	7685	6449	131	9731	8624	187	10209	3743	447	9208	774
Total	887	74967	21910	565	55082	24063	716	54715	17670	2168	61588	6690

#sites = number of sites sampled; #years = number of years sampled; n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/100 m/24 h) per site (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.3.7-9. Mean catch-per-unit-effort (CPUE) calculated for fish species captured in small mesh index gill nets (fish/30 m/24 h) set in Upper Churchill River Region waterbodies, 2008-2010 (and overall).

Species	Granville Lake												SIL-Area 1		
	2008 (#sites=3)			2009 (#sites=4)			2010 (#sites=3)			Overall (#years=3)			2009 (#sites=1)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE	n	CPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	36	14.1	15.69	5	1.4	2.75	32	12.7	13.83	73	9.4	4.02	-	-	-
Spottail Shiner	41	16.0	17.42	31	8.6	17.29	63	25.3	36.92	135	16.7	4.83	-	-	-
Longnose Sucker	-	-	-	-	-	-	1	0.4	0.63	1	0.1	0.12	-	-	-
White Sucker	-	-	-	4	1.3	1.87	1	0.4	0.71	5	0.6	0.37	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	1	0.4	0.71	1	0.1	0.14	-	-	-
Northern Pike	-	-	-	3	0.9	0.60	2	0.8	1.42	5	0.6	0.28	-	-	-
Cisco	23	9.1	14.83	4	1.2	1.56	91	32.2	29.98	118	14.2	9.31	-	-	-
Lake Whitefish	-	-	-	2	0.6	1.10	-	-	-	2	0.2	0.18	1	1.3	-
Troutperch	8	3.2	3.64	96	26.9	49.02	6	2.2	1.04	110	10.8	8.07	1	1.3	-
Burbot	1	8.3	14.43	-	-	-	-	-	-	1	2.8	2.78	-	-	-
Slimy Sculpin	-	-	-	-	-	-	1	0.4	0.63	1	0.1	0.12	1	1.3	-
Yellow Perch	57	22.5	33.33	21	5.9	11.71	61	22.0	23.14	139	16.8	5.46	-	-	-
Logperch	-	-	-	3	0.8	1.67	-	-	-	3	0.3	0.28	-	-	-
Sauger	94	36.1	31.37	24	6.9	4.85	24	8.8	5.57	142	17.3	9.44	-	-	-
Walleye	-	-	-	2	0.7	1.32	7	2.8	4.00	9	1.2	0.85	-	-	-
Total	260	109.4	89.15	195	55.1	72.81	290	108.3	45.12	745	90.9	17.94	3	4.0	-

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/30 m/24 h) per site (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.3.7-9. continued.

Species	SIL-Area 6			SIL-Area 4											
	2010 (#sites=4)			2008 (#sites=6)			2009 (#sites=3)			2010 (#sites=5)			Overall (#years=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	11	3.4	6.05	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	1	0.3	0.58	-	-	-	-	-	-	6	1.3	2.93	6	0.4	0.44
Longnose Sucker	-	-	-	3	0.6	1.42	1	0.5	0.83	1	0.2	0.47	5	0.4	0.11
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	2	0.6	0.70	1	0.2	0.51	-	-	-	-	-	-	1	0.1	0.07
Cisco	40	11.5	8.26	49	10.5	7.39	3	1.2	2.09	28	6.1	3.76	80	5.9	2.68
Lake Whitefish	1	0.3	0.56	1	0.2	0.47	3	1.2	1.18	-	-	-	4	0.5	0.37
Troutperch	36	10.6	2.86	4	1.0	1.75	3	1.4	2.49	1	0.2	0.49	8	0.9	0.36
Burbot	-	-	-	-	-	-	3	1.2	2.09	1	0.2	0.46	4	0.5	0.37
Slimy Sculpin	-	-	-	6	1.4	3.52	-	-	-	-	-	-	6	0.5	0.48
Yellow Perch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	86	25.4	4.39	1	0.2	0.59	-	-	-	4	0.9	1.18	5	0.4	0.26
Walleye	2	0.6	0.66	-	-	-	-	-	-	1	0.2	0.49	1	0.1	0.07
Total	179	52.7	8.15	65	14.1	8.86	13	5.5	3.05	42	9.1	6.03	120	9.6	2.50

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught

CPUE = mean catch per unit effort (fish/30 m/24 h) per site (2008, 2009 and 2010) and per year (overall)

SD = standard deviation; SE = standard error

Table 5.3.7-9. continued.

Species	Gauer Lake											
	2008 (#sites=3)			2009 (#sites=3)			2010 (#sites=3)			Overall (#years=3)		
	n	CPUE	SD	n	CPUE	SD	n	CPUE	SD	n	CPUE	SE
Lake Chub	9	2.8	2.48	1	0.3	0.53	7	2.6	2.35	17	1.9	0.80
Emerald Shiner	15	4.6	7.16	-	-	-	126	47.7	69.89	141	17.4	15.18
Spottail Shiner	335	104.1	90.93	143	49.6	55.90	52	19.6	26.87	530	57.8	24.71
Longnose Sucker	-	-	-	1	0.4	0.75	1	0.4	0.68	2	0.3	0.14
White Sucker	8	2.5	2.15	1	0.4	0.63	-	-	-	9	0.9	0.77
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	8	2.5	1.36	18	6.3	7.24	8	3.0	3.50	34	3.9	1.18
Cisco	3	1.0	1.01	-	-	-	-	-	-	3	0.3	0.33
Lake Whitefish	9	2.9	0.90	4	1.3	1.17	11	4.2	1.84	24	2.8	0.83
Troutperch	70	22.9	18.81	49	15.7	17.17	59	22.7	20.74	178	20.4	2.36
Burbot	5	1.7	2.11	-	-	-	-	-	-	5	0.6	0.55
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	38	11.9	15.40	23	7.6	6.73	6	2.3	3.96	67	7.3	2.78
Logperch	1	0.3	0.55	-	-	-	-	-	-	1	0.1	0.10
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	21	6.5	5.86	32	10.8	9.63	27	10.3	7.19	80	9.2	1.34
Total	522	163.5	96.82	272	92.4	84.82	297	112.8	86.54	1091	122.9	21.16

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught
CPUE = mean catch per unit effort (fish/30 m/24 h) per site (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.3.7-10. Mean biomass-per-unit-effort (BPUE) calculated for fish species captured in small mesh index gill nets (g/30 m/24 h) set in Upper Churchill River Region waterbodies, 2008-2010 (and overall).

Species	Granville Lake												SIL-Area 1		
	2008 (#sites=3)			2009 (#sites=4)			2010 (#sites=3)			Overall (#years=3)			2009 (#sites=1)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE	n	BPUE	SD
Lake Chub	-	-	-	-	-	-	-	-	-				-	-	-
Emerald Shiner	36	62	66	5	6	12	32	49	54	73	39	17	-	-	-
Spottail Shiner	41	78	84	31	13	26	63	138	202	135	76	36	-	-	-
Longnose Sucker	-	-	-	-	-	-	1	7	12	1	2	2	-	-	-
White Sucker	-	-	-	4	816	1404	1	13	22	5	276	270	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	1	168	291	1	56	56	-	-	-
Northern Pike	-	-	-	3	735	575	2	939	1627	5	558	285	-	-	-
Cisco	23	150	232	4	88	137	91	643	404	118	294	175	-	-	-
Lake Whitefish	-	-	-	2	366	733	-	-	-	2	122	122	1	255	-
Troutperch	8	32	36	96	129	234	6	11	1	110	57	36	1	23	-
Burbot	1	23	41	-	-	-	-	-	-	1	8	8	-	-	-
Slimy Sculpin	-	-	-	-	-	-	1	1	1	1	0	0	1	7	-
Yellow Perch	57	326	410	21	37	74	61	387	345	139	250	108	-	-	-
Logperch	-	-	-	3	2	4	-	-	-	3	1	1	-	-	-
Sauger	94	2771	2477	24	875	917	24	1082	523	142	1576	600	-	-	-
Walleye	-	-	-	2	479	958	7	831	1068	9	437	241	-	-	-
Total	260	3444	3190	195	3546	3009	290	4270	2785	745	3753	260	1	284	-

#sites = number of sites sampled; #years = number of years sampled; n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/30 m/24 h) per site (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.3.7-10. continued.

Species	SIL-Area 6			SIL-Area 4											
	2010 (#sites=4)			2008 (#sites=6)			2009 (#sites=3)			2010 (#sites=5)			Overall (#years=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE
Lake Chub	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Emerald Shiner	11	13	23	-	-	-	-	-	-	-	-	-	-	-	-
Spottail Shiner	1	2	5	-	-	-	-	-	-	6	9	20	6	3	3
Longnose Sucker	-	-	-	3	205	501	1	48	83	1	2	5	5	85	61
White Sucker	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	2	703	882	1	250	613	-	-	-	-	-	-	1	83	83
Cisco	40	544	161	49	279	145	3	80	139	28	794	781	80	384	213
Lake Whitefish	1	104	207	1	141	345	3	504	589	-	-	-	4	215	150
Troutperch	36	64	26	4	15	29	3	24	42	1	2	5	8	14	6
Burbot	-	-	-	-	-	-	3	1116	1934	1	97	217	4	405	357
Slimy Sculpin	-	-	-	6	10	23	-	-	-	-	-	-	6	3	3
Yellow Perch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logperch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sauger	86	2903	488	1	24	59	-	-	-	4	41	57	5	22	12
Walleye	2	383	661	-	-	-	-	-	-	1	155	347	1	52	52
Total	179	4717	1492	65	923	994	13	1773	1944	42	1100	1064	120	1265	259

#sites = number of sites sampled; #years = number of years sampled; n = number of fish caught

BPUE = mean biomass per unit effort per site (2008, 2009 and 2010) and per year (overall)

SD = standard deviation; SE = standard error

Table 5.3.7-10. continued.

Species	Gauer Lake											
	2008 (#sites=3)			2009 (#sites=3)			2010 (#sites=3)			Overall (#years=3)		
	n	BPUE	SD	n	BPUE	SD	n	BPUE	SD	n	BPUE	SE
Lake Chub	9	17	15	1	3	5	7	16	17	17	12	5
Emerald Shiner	15	24	35	-	-	-	126	146	205	141	57	45
Spottail Shiner	335	422	366	143	209	239	52	74	86	530	235	101
Longnose Sucker	-	-	-	1	224	388	1	81	140	2	102	65
White Sucker	8	34	30	1	5	9	-	-	-	9	13	11
Shorthead Redhorse	-	-	-	-	-	-	-	-	-	-	-	-
Northern Pike	8	1573	200	18	5155	5589	8	4187	4261	34	3638	1070
Cisco	3	130	210	-	-	-	-	-	-	3	43	43
Lake Whitefish	9	1164	1048	4	596	569	11	1352	973	24	1037	227
Troutperch	70	112	130	49	75	84	59	94	78	178	94	11
Burbot	5	8	11	-	-	-	-	-	-	5	3	3
Slimy Sculpin	-	-	-	-	-	-	-	-	-	-	-	-
Yellow Perch	38	119	147	23	346	465	6	82	142	67	182	82
Logperch	1	3	5	-	-	-	-	-	-	1	1	1
Sauger	-	-	-	-	-	-	-	-	-	-	-	-
Walleye	21	1622	2180	32	2701	2349	27	2685	101	80	2336	357
Total	522	5228	2287	272	9314	8292	297	8717	4227	1091	7753	1274

#sites = number of sites sampled; #years = number of years sampled; n = number of fish measured (may not equal number of fish caught)
BPUE = mean biomass per unit effort (g/30 m/24 h) per site (2008, 2009 and 2010) and per year (overall)
SD = standard deviation; SE = standard error

Table 5.3.7-11. Summary of mean fork length (mm), weight (g), and condition factor (K) calculated for Northern Pike captured in standard gang and small mesh index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

Mesh (in)	Granville Lake									SIL-Area 1		
	2008			2009			2010			2009		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	-	-	-	14	440	103	16	603	88	19	516	52
3	-	-	-	15	589	55	17	565	96	19	549	67
3.75	-	-	-	8	632	39	6	708	55	4	587	48
4.25	-	-	-	3	625	50	3	617	64	1	642	-
5	-	-	-	-	-	-	2	678	31	-	-	-
Total	-	-	-	40	548	109	44	607	95	43	540	64
Weight (g)												
SM	-	-	-	3	830	316	2	1145	516	-	-	-
2	25	748	-	13	742	598	16	1593	885	18	911	274
3	17	1271	-	14	1517	418	17	1413	1032	18	1060	305
3.75	7	1809	-	8	1795	402	6	2628	802	4	1360	392
4.25	3	1920	208	3	1817	542	3	1580	507	1	1750	-
5	-	-	-	-	-	-	2	2090	438	-	-	-
Total	52	1129	-	41	1297	644	46	1663	950	41	1041	337
Condition Factor (K)												
2	-	-	-	13	0.70	0.05	16	0.67	0.07	18	0.67	0.09
3	-	-	-	14	0.70	0.06	17	0.69	0.09	18	0.65	0.07
3.75	-	-	-	8	0.70	0.09	6	0.73	0.06	4	0.66	0.05
4.25	-	-	-	3	0.73	0.05	3	0.65	0.06	1	0.66	-
5	-	-	-	-	-	-	2	0.67	0.05	-	-	-
Total	-	-	-	38	0.70	0.06	44	0.68	0.08	41	0.66	0.08

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-11. continued.

Mesh (in)	SIL-Area 6			SIL-Area 4								
	2010			2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	13	480	88	-	-	-	13	562	55	11	499	80
3	10	546	72	-	-	-	53	560	61	25	541	82
3.75	3	573	66	-	-	-	27	578	79	13	614	53
4.25	-	-	-	-	-	-	6	636	39	4	647	53
5	-	-	-	-	-	-	3	650	71	2	612	54
Total	26	516	86	-	-	-	102	572	68	55	560	85
Weight (g)												
SM	2	1170	537	1	1210	-	-	-	-	-	-	-
2	13	806	470	32	1152	-	13	1230	416	11	955	453
3	10	1104	533	73	1132	-	50	1150	355	25	1186	632
3.75	3	1260	516	42	1321	-	25	1324	362	12	1597	446
4.25	-	-	-	18	1599	-	6	1758	348	4	2093	383
5	-	-	-	2	1310	156	3	2053	660	2	1950	919
Total	28	987	505	168	1236	-	97	1271	420	54	1326	631
Condition Factor (K)												
2	13	0.66	0.05	-	-	-	13	0.68	0.06	11	0.72	0.06
3	10	0.64	0.07	-	-	-	50	0.63	0.09	25	0.70	0.06
3.75	3	0.64	0.07	-	-	-	25	0.67	0.06	12	0.70	0.06
4.25	-	-	-	-	-	-	6	0.68	0.05	4	0.78	0.08
5	-	-	-	-	-	-	3	0.73	0.06	2	0.82	0.18
Total	26	0.65	0.06	-	-	-	97	0.65	0.08	54	0.71	0.07

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-11. continued.

Mesh (in)	Gauer Lake								
	2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)									
SM	3	629	31	7	662	133	8	567	86
2	48	516	132	29	514	138	47	499	114
3	41	544	63	30	570	61	46	559	58
3.75	22	632	84	13	599	49	21	622	71
4.25	10	682	66	5	728	101	5	682	72
5	5	651	206	3	537	170	3	754	234
Total	129	566	117	87	571	117	130	557	107
Weight (g)									
SM	8	619	-	18	829	-	8	1401	635
2	48	1157	1108	29	1105	728	47	958	699
3	41	1145	371	30	1219	377	46	1142	381
3.75	22	1820	953	13	1481	298	21	1702	675
4.25	10	2305	825	5	2868	1368	5	2323	608
5	5	2664	2523	3	1110	757	3	3994	4093
Total	134	1372	-	98	1229	-	130	1293	936
Condition Factor (K)									
2	48	0.69	0.07	29	0.69	0.06	47	0.67	0.07
3	41	0.69	0.07	30	0.64	0.06	46	0.64	0.08
3.75	22	0.68	0.10	13	0.69	0.05	21	0.68	0.05
4.25	10	0.71	0.10	5	0.70	0.09	5	0.72	0.09
5	5	0.76	0.04	3	0.62	0.08	3	0.72	0.12
Total	126	0.69	0.08	80	0.67	0.07	122	0.66	0.07

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-12. Summary of mean fork length (mm), weight (g), and condition factor (K) calculated for Lake Whitefish captured in standard gang and small mesh index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

Mesh (in)	Granville Lake									SIL-Area 1		
	2008			2009			2010			2009		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	12	212	26	16	293	73	23	265	99	10	251	93
3	4	362	119	14	309	74	8	333	61	15	334	70
3.75	2	363	95	13	382	49	8	331	36	17	405	42
4.25	1	430	-	15	433	29	4	436	51	16	411	40
5	2	380	57	9	447	26	6	417	41	5	460	68
Total	21	281	100	67	366	83	49	319	97	63	370	87
Weight (g)												
SM	-	-	-	2	665	-	-	-	-	1	190	-
2	12	139	65	15	423	389	23	315	376	10	3860	554
3	4	970	754	14	569	475	8	601	406	14	675	481
3.75	2	900	693	13	981	415	8	544	213	17	1205	441
4.25	1	1430	-	15	1383	269	4	1320	561	16	1236	322
5	2	935	460	9	1610	352	6	1130	363	5	1676	687
Total	21	507	568	68	936	-	49	581	496	63	987	597
Condition Factor (K)												
2	12	1.39	0.12	15	1.43	0.20	23	1.30	0.24	10	1.52	0.30
3	4	1.59	0.16	14	1.59	0.19	8	1.47	0.11	14	1.58	0.16
3.75	2	1.67	0.12	13	1.66	0.15	8	1.46	0.12	17	1.73	0.17
4.25	1	1.80	-	15	1.69	0.09	4	1.52	0.11	16	1.73	0.13
5	2	1.63	0.11	9	1.77	0.14	6	1.52	0.08	5	1.67	0.13
Total	21	1.5	0.18	66	1.61	0.19	49	1.4	0.20	62	1.66	0.20

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-12. continued.

Mesh (in)	SIL-Area 6			SIL-Area 4								
	2010			2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	10	297	73	126	261	51	57	287	58	53	280	58
3	9	320	59	223	327	38	86	327	43	66	317	35
3.75	7	353	44	138	362	33	74	351	71	36	358	32
4.25	1	352	-	110	373	34	38	394	57	17	397	34
5	1	348	-	35	399	29	6	407	29	2	301	148
Total	28	322	61	632	334	57	261	337	67	174	322	57
Weight (g)												
SM	1	370	-	1	730	-	3	427	-	-	-	-
2	10	478	367	126	257	189	56	349	214	52	304	207
3	9	562	300	221	493	199	83	479	199	66	423	143
3.75	7	687	276	138	673	198	70	551	179	36	591	154
4.25	1	630	-	109	749	222	36	804	194	17	803	189
5	1	720	-	35	938	224	6	953	228	2	500	580
Total	29	564	307	630	555	279	254	527	-	173	460	232
Condition Factor (K)												
2	10	1.56	0.14	126	1.24	0.15	56	1.28	0.16	52	1.18	0.13
3	9	1.57	0.07	221	1.34	0.16	83	1.28	0.11	66	1.28	0.12
3.75	7	1.50	0.11	138	1.38	0.15	70	1.33	0.13	36	1.27	0.09
4.25	1	1.44	-	109	1.40	0.15	36	1.39	0.10	17	1.26	0.09
5	1	1.71	-	35	1.46	0.21	6	1.40	0.17	2	1.28	0.11
Total	28	1.55	0.11	629	1.35	0.17	251	1.31	0.13	173	1.25	0.12

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-12. continued.

Mesh (in)	Gauer Lake								
	2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)									
2	73	295	90	29	302	84	68	304	55
3	53	364	52	21	339	63	36	329	52
3.75	44	381	45	14	379	57	25	390	48
4.25	22	397	41	29	405	43	34	405	46
5	20	419	29	12	433	32	9	423	54
Total	212	352	78	105	363	77	172	348	68
Weight (g)									
SM	9	398	-	4	438	-	11	318	-
2	73	490	485	29	517	478	68	415	244
3	53	767	372	21	638	396	36	536	285
3.75	44	840	339	14	896	467	25	886	338
4.25	22	966	326	29	1040	341	34	1022	363
5	20	1147	274	12	1344	311	9	1158	419
Total	221	729	-	109	816	-	183	646	-
Condition Factor (K)									
2	73	1.39	0.20	29	1.43	0.17	68	1.33	0.10
3	53	1.48	0.17	21	1.45	0.13	36	1.38	0.10
3.75	44	1.45	0.18	14	1.52	0.14	25	1.43	0.15
4.25	22	1.50	0.18	29	1.51	0.09	34	1.48	0.14
5	20	1.54	0.15	12	1.63	0.08	9	1.46	0.16
Total	212	1.45	0.19	105	1.49	0.14	172	1.39	0.13

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-13. Summary of mean fork length (mm), weight (g), and condition factor (K) calculated for Walleye captured in standard gang index and small mesh gill nets set in the Upper Churchill River Region from 2008-2010.

Mesh (in)	Granville Lake									SIL-Area 1		
	2008			2009			2010			2009		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	32	327	62	3	354	78	86	325	68	8	353	78
3	27	382	51	2	423	40	30	389	33	3	355	34
3.75	10	400	25	2	347	49	25	405	32	1	427	-
4.25	15	409	50	1	452	-	8	429	22	-	-	-
5	2	412	31	-	-	-	2	453	4	-	-	-
Total	86	369	62	8	382	64	151	358	68	12	359	67
Weight (g)												
SN	-	-	-	2	725	-	7	299	-	-	-	-
2	32	407	220	3	513	332	84	427	266	8	576	353
3	27	626	223	2	860	212	30	667	191	3	530	166
3.75	10	752	171	2	500	226	25	764	189	1	850	-
4.25	15	827	314	1	1140	-	8	990	173	-	-	-
5	2	855	205	-	-	-	2	1120	71	-	-	-
Total	86	599	283	10	685	-	156	559	-	12	588	303
Condition Factor (K)												
2	32	1.03	0.09	3	1.00	0.20	84	1.07	0.09	8	1.19	0.10
3	27	1.06	0.06	2	1.13	0.04	30	1.11	0.10	3	1.16	0.02
3.75	10	1.16	0.12	2	1.15	0.04	25	1.14	0.09	1	1.09	-
4.25	15	1.15	0.09	1	1.23	-	8	1.24	0.12	-	-	-
5	2	1.21	0.01	-	-	-	2	1.20	0.04	-	-	-
Total	86	1.08	0.10	8	1.10	0.14	149	1.10	0.10	12	1.17	0.09

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-13. continued.

Mesh (in)	SIL-Area 6			SIL-Area 4								
	2010			2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)												
2	3	240	11	-	-	-	-	-	-	4	287	31
3	-	-	-	-	-	-	-	-	-	6	361	57
3.75	2	456	17	-	-	-	-	-	-	2	402	27
4.25	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
Total	5	326	119	-	-	-	-	-	-	12	343	61
Weight (g)												
SN	2	680	764	-	-	-	-	-	-	1	710	-
2	3	147	21	-	-	-	-	-	-	4	270	81
3	-	-	-	-	-	-	-	-	-	6	622	346
3.75	2	990	85	-	-	-	-	-	-	2	890	198
4.25	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
Total	7	540	500	-	-	-	-	-	-	13	562	324
Condition Factor (K)												
2	3	1.06	0.02	-	-	-	-	-	-	4	1.11	0.03
3	-	-	-	-	-	-	-	-	-	6	1.21	0.09
3.75	2	1.04	0.03	-	-	-	-	-	-	2	1.36	0.04
4.25	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-
Total	5	1.05	0.02	-	-	-	-	-	-	12	1.20	0.11

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-13. continued.

Mesh (in)	Gauer Lake								
	2008			2009			2010		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Fork Length (mm)									
SM	-	-	-	-	-	-	3	398	121
2	50	355	57	40	364	74	55	349	71
3	34	397	45	42	374	42	69	394	34
3.75	29	414	45	33	411	51	46	407	31
4.25	13	420	54	12	465	44	12	426	72
5	3	450	24	4	422	39	5	439	71
Total	129	388	57	131	390	63	190	387	58
Weight (g)									
SN	21	251	-	32	253	-	27	263	-
2	50	526	258	40	585	311	55	523	280
3	34	708	254	42	589	220	69	690	191
3.75	29	824	268	33	785	247	46	764	180
4.25	13	896	281	12	1163	278	12	935	353
5	3	1053	211	4	955	221	5	974	438
Total	150	629	-	163	613	-	214	630	-
Condition Factor (K)									
2	50	1.08	0.10	40	1.07	0.07	55	1.10	0.10
3	34	1.09	0.08	42	1.08	0.10	69	1.11	0.09
3.75	29	1.13	0.10	33	1.09	0.08	46	1.12	0.08
4.25	13	1.17	0.11	12	1.15	0.12	12	1.13	0.06
5	3	1.15	0.08	4	1.26	0.08	5	1.09	0.03
Total	129	1.10	0.10	131	1.09	0.09	187	1.11	0.09

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-14. Year-class frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010

Year-Class	Granville Lake						SIL-Area 1		SIL-Area 6		SIL-Area 4						Gauer Lake					
	2008		2009		2010		2009		2010		2008		2009		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2008	-	-	-	-	-	-	-	-	1	3.85	-	-	-	-	-	-	-	-	-	-	1	1.27
2007	-	-	-	-	1	2.27	-	-	1	3.85	-	-	-	-	3	5.45	-	-	3	3.80	6	7.59
2006	-	-	3	7.50	3	6.82	-	-	2	7.69	-	-	-	-	1	1.82	4	3.17	3	3.80	9	11.39
2005	-	-	4	10.00	13	29.55	-	-	5	19.23	-	-	1	0.99	7	12.73	14	11.11	6	7.59	13	16.46
2004	-	-	3	7.50	6	13.64	4	9.52	3	11.54	-	-	3	2.97	5	9.09	15	11.90	5	6.33	24	30.38
2003	-	-	5	12.50	3	6.82	8	19.05	4	15.38	-	-	6	5.94	5	9.09	36	28.57	11	13.92	14	17.72
2002	-	-	3	7.50	10	22.73	4	9.52	1	3.85	-	-	15	14.85	8	14.55	30	23.81	15	18.99	4	5.06
2001	-	-	5	12.50	5	11.36	12	28.57	4	15.38	-	-	9	8.91	7	12.73	13	10.32	20	25.32	5	6.33
2000	-	-	4	10.00	3	6.82	6	14.29	2	7.69	-	-	18	17.82	6	10.91	6	4.76	7	8.86	2	2.53
1999	-	-	7	17.50	-	-	5	11.90	-	-	-	-	25	24.75	6	10.91	3	2.38	5	6.33	-	-
1998	-	-	2	5.00	-	-	3	7.14	2	7.69	-	-	11	10.89	5	9.09	2	1.59	2	2.53	-	-
1997	-	-	-	-	-	-	-	-	1	3.85	-	-	5	4.95	1	1.82	1	0.79	-	-	-	-
1996	-	-	3	7.50	-	-	-	-	-	-	-	-	3	2.97	1	1.82	-	-	-	-	-	-
1995	-	-	1	2.50	-	-	-	-	-	-	-	-	2	1.98	-	-	-	-	2	2.53	-	-
1994	-	-	-	-	-	-	-	-	-	-	-	-	1	0.99	-	-	1	0.79	-	-	1	1.27
1993	-	-	-	-	-	-	-	-	-	-	-	-	1	0.99	-	-	1	0.79	-	-	-	-
1992	-	-	-	-	-	-	-	-	-	-	-	-	1	0.99	-	-	-	-	-	-	-	-
Total	-	-	40	100	44	100	42	100	26	100	-	-	101	100	55	100	126	100	79	100	79	100

n = number of fish aged (may not equal number of fish caught); % = percent of total number of fish aged

Table 5.3.7-15. Year-class frequency distributions (%) for Lake Whitefish captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

Year-Class	Granville Lake						SIL-Area 1		SIL-Area 6		SIL-Area 4						Gauer Lake					
	2008		2009		2010		2009		2010		2008		2009		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2008	-	-	-	-	2	4.08	-	-	1	3.70	-	-	-	-	-	-	-	-	-	-	-	-
2007	-	-	7	10.45	11	22.45	2	3.23	6	22.22	-	-	-	-	-	-	-	-	4	3.88	1	0.95
2006	8	38.10	8	11.94	8	16.33	5	8.06	10	37.04	1	0.16	1	0.39	1	0.57	11	5.26	12	11.65	15	14.29
2005	6	28.57	8	11.94	8	16.33	8	12.90	6	22.22	1	0.16	1	0.39	2	1.15	12	5.74	6	5.83	12	11.43
2004	-	-	2	2.99	4	8.16	3	4.84	2	7.41	12	1.90	1	0.39	4	2.30	21	10.05	7	6.80	4	3.81
2003	2	9.52	4	5.97	2	4.08	7	11.29	1	3.70	40	6.34	12	4.72	13	7.47	13	6.22	4	3.88	10	9.52
2002	-	-	14	20.90	8	16.33	17	27.42	-	-	24	3.80	7	2.76	9	5.17	26	12.44	10	9.71	16	15.24
2001	2	9.52	7	10.45	1	2.04	10	16.13	1	3.70	34	5.39	25	9.84	12	6.90	38	18.18	11	10.68	6	5.71
2000	2	9.52	3	4.48	3	6.12	3	4.84	-	-	144	22.82	41	16.14	17	9.77	24	11.48	11	10.68	11	10.48
1999	1	4.76	4	5.97	-	-	2	3.23	-	-	168	26.62	98	38.58	71	40.80	18	8.61	10	9.71	9	8.57
1998	-	-	3	4.48	1	2.04	5	8.06	-	-	45	7.13	15	5.91	11	6.32	13	6.22	4	3.88	3	2.86
1997	-	-	3	4.48	-	-	-	-	-	-	57	9.03	17	6.69	10	5.75	9	4.31	3	2.91	2	1.90
1996	-	-	-	-	-	-	-	-	-	-	46	7.29	15	5.91	6	3.45	3	1.44	1	0.97	1	0.95
1995	-	-	2	2.99	-	-	-	-	-	-	28	4.44	6	2.36	11	6.32	4	1.91	4	3.88	1	0.95
1994	-	-	2	2.99	-	-	-	-	-	-	15	2.38	6	2.36	4	2.30	6	2.87	4	3.88	1	0.95
1993	-	-	-	-	-	-	-	-	-	-	8	1.27	4	1.57	2	1.15	5	2.39	3	2.91	5	4.76
1992	-	-	-	-	1	2.04	-	-	-	-	3	0.48	1	0.39	-	-	1	0.48	4	3.88	2	1.90
1991	-	-	-	-	-	-	-	-	-	-	-	-	1	0.39	1	0.57	1	0.48	1	0.97	4	3.81
1990	-	-	-	-	-	-	-	-	-	-	2	0.32	3	1.18	-	-	2	0.96	-	-	-	-
1989	-	-	-	-	-	-	-	-	-	-	2	0.32	-	-	-	-	-	-	1	0.97	-	-
1988	-	-	-	-	-	-	-	-	-	-	1	0.16	-	-	-	-	2	0.96	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.94	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.97	-	-
1983	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.95
1980	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.95
Total	21	100	67	100	49	100	62	100	27	100	631	100	254	100	174	100	209	100	103	100	105	100

n = number of fish aged (may not equal number of fish caught); % = percent of total number of fish aged

Table 5.3.7-16. Year-class frequency distributions (%) for Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

Year-Class	Granville Lake						SIL-Area 1		SIL-Area 6		SIL-Area 4						Gauer Lake					
	2008		2009		2010		2009		2010		2008		2009		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2007	-	-	-	-	4	2.68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2006	3	3.53	-	-	25	16.78	1	8.33	3	60.00	-	-	-	-	4	33.33	-	-	2	1.59	1	0.93
2005	5	5.88	2	25.00	21	14.09	-	-	-	-	-	-	-	-	3	25.00	1	0.81	2	1.59	4	3.74
2004	-	-	-	-	-	-	1	8.33	-	-	-	-	-	-	1	8.33	2	1.63	4	3.17	2	1.87
2003	9	10.59	-	-	29	19.46	3	25.00	-	-	-	-	-	-	3	25.00	8	6.50	1	0.79	11	10.28
2002	7	8.24	-	-	32	21.48	1	8.33	1	20.00	-	-	-	-	1	8.33	14	11.38	7	5.56	13	12.15
2001	22	25.88	1	12.50	22	14.77	2	16.67	-	-	-	-	-	-	-	-	15	12.20	12	9.52	11	10.28
2000	3	3.53	-	-	3	2.01	2	16.67	1	20.00	-	-	-	-	-	-	22	17.89	16	12.70	20	18.69
1999	4	4.71	1	12.50	2	1.34	1	8.33	-	-	-	-	-	-	-	-	12	9.76	32	25.40	11	10.28
1998	10	11.76	1	12.50	4	2.68	-	-	-	-	-	-	-	-	-	-	22	17.89	8	6.35	11	10.28
1997	8	9.41	1	12.50	-	-	1	8.33	-	-	-	-	-	-	-	-	19	15.45	6	4.76	8	7.48
1996	8	9.41	-	-	7	4.70	-	-	-	-	-	-	-	-	-	-	7	5.69	12	9.52	9	8.41
1995	1	1.18	1	12.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	11.90	5	4.67
1994	5	5.88	1	12.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	5.56	1	0.93
1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.79	-	-
1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.81	-	-	-	-
1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.79	-	-
Total	85	100	8	100	149	100	12	100	5	100	-	-	-	-	12	100	123	100	126	100	107	100

n = number of fish aged (may not equal number of fish caught); % = percent of total number of fish aged

Table 5.3.7-17. Age frequency distributions (%) for Northern Pike captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

Age	Granville Lake						SIL-Area 1		SIL-Area 6		SIL-Area 4						Gauer Lake					
	2008		2009		2010		2009		2010		2008		2009		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2	-	-	-	-	-	-	-	-	1	3.85	-	-	-	-	-	-	4	3.17	3	3.80	1	1.27
3	-	-	3	7.50	1	2.27	-	-	1	3.85	-	-	-	-	3	5.45	14	11.11	3	3.80	6	7.59
4	-	-	4	10.00	3	6.82	-	-	2	7.69	-	-	1	0.99	1	1.82	15	11.90	6	7.59	9	11.39
5	-	-	3	7.50	13	29.55	4	9.52	5	19.23	-	-	3	2.97	7	12.73	36	28.57	5	6.33	13	16.46
6	-	-	5	12.50	6	13.64	8	19.05	3	11.54	-	-	6	5.94	5	9.09	30	23.81	11	13.92	24	30.38
7	-	-	3	7.50	3	6.82	4	9.52	4	15.38	-	-	15	14.85	5	9.09	13	10.32	15	18.99	14	17.72
8	-	-	5	12.50	10	22.73	12	28.57	1	3.85	-	-	9	8.91	8	14.55	6	4.76	20	25.32	4	5.06
9	-	-	4	10.00	5	11.36	6	14.29	4	15.38	-	-	18	17.82	7	12.73	3	2.38	7	8.86	5	6.33
10	-	-	7	17.50	3	6.82	5	11.90	2	7.69	-	-	25	24.75	6	10.91	2	1.59	5	6.33	2	2.53
11	-	-	2	5.00	-	-	3	7.14	-	-	-	-	11	10.89	6	10.91	1	0.79	2	2.53	-	-
12	-	-	-	-	-	-	-	-	2	7.69	-	-	5	4.95	5	9.09	-	-	-	-	-	-
13	-	-	3	7.50	-	-	-	-	1	3.85	-	-	3	2.97	1	1.82	-	-	-	-	-	-
14	-	-	1	2.50	-	-	-	-	-	-	-	-	2	1.98	1	1.82	1	0.79	2	2.53	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	1	0.99	-	-	1	0.79	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-	1	0.99	-	-	-	-	-	-	1	1.27
17	-	-	-	-	-	-	-	-	-	-	-	-	1	0.99	-	-	-	-	-	-	-	-
Total	-	-	40	100	44	100	42	100	26	100	-	-	101	100	55	100	126	100	79	100	79	100

n = number of fish aged (may not equal number of fish caught); % = percent of total number of fish aged

Table 5.3.7-18. Age frequency distributions (%) for Lake Whitefish captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

Age	Granville Lake						SIL-Area 1		SIL-Area 6		SIL-Area 4						Gauer Lake					
	2008		2009		2010		2009		2010		2008		2009		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2	8	38.10	7	10.45	2	4.08	2	3.23	1	3.70	1	0.16	-	-	-	-	11	5.26	4	3.88	-	-
3	6	28.57	8	11.94	11	22.45	5	8.06	6	22.22	1	0.16	1	0.39	-	-	12	5.74	12	11.65	1	0.95
4	-	-	8	11.94	8	16.33	8	12.90	10	37.04	12	1.90	1	0.39	1	0.57	21	10.05	6	5.83	15	14.29
5	2	9.52	2	2.99	8	16.33	3	4.84	6	22.22	40	6.34	1	0.39	2	1.15	13	6.22	7	6.80	12	11.43
6	-	-	4	5.97	4	8.16	7	11.29	2	7.41	24	3.80	12	4.72	4	2.30	26	12.44	4	3.88	4	3.81
7	2	9.52	14	20.90	2	4.08	17	27.42	1	3.70	34	5.39	7	2.76	13	7.47	38	18.18	10	9.71	10	9.52
8	2	9.52	7	10.45	8	16.33	10	16.13	-	-	144	22.82	25	9.84	9	5.17	24	11.48	11	10.68	16	15.24
9	1	4.76	3	4.48	1	2.04	3	4.84	1	3.70	168	26.62	41	16.14	12	6.90	18	8.61	11	10.68	6	5.71
10	-	-	4	5.97	3	6.12	2	3.23	-	-	45	7.13	98	38.58	17	9.77	13	6.22	10	9.71	11	10.48
11	-	-	3	4.48	-	-	5	8.06	-	-	57	9.03	15	5.91	71	40.80	9	4.31	4	3.88	9	8.57
12	-	-	3	4.48	1	2.04	-	-	-	-	46	7.29	17	6.69	11	6.32	3	1.44	3	2.91	3	2.86
13	-	-	-	-	-	-	-	-	-	-	28	4.44	15	5.91	10	5.75	4	1.91	1	0.97	2	1.90
14	-	-	2	2.99	-	-	-	-	-	-	15	2.38	6	2.36	6	3.45	6	2.87	4	3.88	1	0.95
15	-	-	2	2.99	-	-	-	-	-	-	8	1.27	6	2.36	11	6.32	5	2.39	4	3.88	1	0.95
16	-	-	-	-	-	-	-	-	-	-	3	0.48	4	1.57	4	2.30	1	0.48	3	2.91	1	0.95
17	-	-	-	-	-	-	-	-	-	-	-	-	1	0.39	2	1.15	1	0.48	4	3.88	5	4.76
18	-	-	-	-	1	2.04	-	-	-	-	2	0.32	1	0.39	-	-	2	0.96	1	0.97	2	1.90
19	-	-	-	-	-	-	-	-	-	-	2	0.32	3	1.18	1	0.57	-	-	-	-	4	3.81
20	-	-	-	-	-	-	-	-	-	-	1	0.16	-	-	-	-	2	0.96	1	0.97	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.94	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.97	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.95
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.95
Total	21	100	67	100	49	100	62	100	27	100	631	100	254	100	174	100	209	100	103	100	105	100

n = number of fish aged (may not equal number of fish caught); % = percent of total number of fish aged

Table 5.3.7-19. Age frequency distributions (%) for Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

Age	Granville Lake						SIL-Area 1		SIL-Area 6		SIL-Area 4						Gauer Lake					
	2008		2009		2010		2009		2010		2008		2009		2010		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
2	3	3.53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	5	5.88	-	-	4	2.68	1	8.33	-	-	-	-	-	-	-	-	1	0.81	2	1.59	-	-
4	-	-	2	25.00	25	16.78	-	-	3	60.00	-	-	-	-	4	33.33	2	1.63	2	1.59	1	0.93
5	9	10.59	-	-	21	14.09	1	8.33	-	-	-	-	-	-	3	25.00	8	6.50	4	3.17	4	3.74
6	7	8.24	-	-	-	-	3	25.00	-	-	-	-	-	-	1	8.33	14	11.38	1	0.79	2	1.87
7	22	25.88	-	-	29	19.46	1	8.33	-	-	-	-	-	-	3	25.00	15	12.20	7	5.56	11	10.28
8	3	3.53	1	12.50	32	21.48	2	16.67	1	20.00	-	-	-	-	1	8.33	22	17.89	12	9.52	13	12.15
9	4	4.71	-	-	22	14.77	2	16.67	-	-	-	-	-	-	-	-	12	9.76	16	12.70	11	10.28
10	10	11.76	1	12.50	3	2.01	1	8.33	1	20.00	-	-	-	-	-	-	22	17.89	32	25.40	20	18.69
11	8	9.41	1	12.50	2	1.34	-	-	-	-	-	-	-	-	-	-	19	15.45	8	6.35	11	10.28
12	8	9.41	1	12.50	4	2.68	1	8.33	-	-	-	-	-	-	-	-	7	5.69	6	4.76	11	10.28
13	1	1.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	9.52	8	7.48
14	5	5.88	1	12.50	7	4.70	-	-	-	-	-	-	-	-	-	-	-	-	15	11.90	9	8.41
15	-	-	1	12.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	5.56	5	4.67
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.81	1	0.79	1	0.93
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.79	-	-
Total	85	100	8	100	149	100	12	100	5	100	-	-	-	-	12	100	123	100	126	100	107	100

Table 5.3.7-20. Mean fork length- (mm), weight- (g), and condition factor- (K) at-age for Northern Pike captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

Age	Granville Lake																													
	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2006	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2005	-	-	-	-	-	-	-	-	-	2006	3	335	76	2	405	21	2	0.70	0.01	2007	1	442	-	1	620	-	1	0.70	-
4	2004	-	-	-	-	-	-	-	-	-	2005	4	414	49	3	427	102	3	0.70	0.05	2006	3	471	39	3	663	155	3	0.60	0.02
5	2003	-	-	-	-	-	-	-	-	-	2004	3	450	9	3	623	95	3	0.70	0.07	2005	13	555	71	13	1217	476	13	0.70	0.04
6	2002	-	-	-	-	-	-	-	-	-	2003	5	527	23	5	984	121	5	0.70	0.02	2004	6	599	78	6	1540	694	6	0.70	0.05
7	2001	-	-	-	-	-	-	-	-	-	2002	3	497	86	3	867	395	3	0.70	0.05	2003	3	649	53	3	2153	652	3	0.80	0.07
8	2000	-	-	-	-	-	-	-	-	-	2001	5	592	47	5	1424	348	5	0.70	0.04	2002	10	658	53	10	1946	516	10	0.70	0.06
9	1999	-	-	-	-	-	-	-	-	-	2000	4	640	49	4	2023	461	4	0.80	0.08	2001	5	685	110	5	2632	1746	5	0.70	0.16
10	1998	-	-	-	-	-	-	-	-	-	1999	7	630	36	7	1763	327	7	0.70	0.08	2000	3	695	81	3	2483	1451	3	0.70	0.14
11	1997	-	-	-	-	-	-	-	-	-	1998	2	607	49	2	1575	460	2	0.70	0.04	1999	-	-	-	-	-	-	-	-	-
12	1996	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
13	1995	-	-	-	-	-	-	-	-	-	1996	3	654	31	3	2037	441	3	0.70	0.07	1997	-	-	-	-	-	-	-	-	-
14	1994	-	-	-	-	-	-	-	-	-	1995	1	682	-	1	2400	-	1	0.80	-	1996	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-20. continued.

Age	SIL-Area 1										SIL-Area 6									
	2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2007	-	-	-	-	-	-	-	-	-	2008	1	324	-	1	240	-	1	0.70	-
3	2006	-	-	-	-	-	-	-	-	-	2007	1	364	-	1	310	-	1	0.60	-
4	2005	-	-	-	-	-	-	-	-	-	2006	2	422	57	2	500	184	2	0.70	0.01
5	2004	4	525	130	3	723	355	3	0.60	0.12	2005	5	475	13	5	714	92	5	0.70	0.04
6	2003	8	515	50	8	958	264	8	0.70	0.03	2004	3	512	45	3	947	291	3	0.70	0.05
7	2002	4	559	62	4	1185	429	4	0.70	0.06	2003	4	509	6	4	775	31	4	0.60	0.02
8	2001	12	544	54	12	1128	370	12	0.70	0.10	2002	1	570	-	1	1080	-	1	0.60	-
9	2000	6	566	52	6	1140	348	6	0.60	0.07	2001	4	559	61	4	1105	466	4	0.60	0.04
10	1999	5	550	36	5	1052	186	5	0.60	0.07	2000	2	607	66	2	1645	587	2	0.70	0.03
11	1998	3	566	36	2	1025	106	2	0.60	0.01	1999	-	-	-	-	-	-	-	-	-
12	1997	-	-	-	-	-	-	-	-	-	1998	2	649	24	2	1820	495	2	0.70	0.11
13	1996	-	-	-	-	-	-	-	-	-	1997	1	620	-	1	1810	-	1	0.80	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-20. continued.

Age	SIL-Area 4																													
	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2006	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2005	-	-	-	-	-	-	-	-	-	2006	-	-	-	-	-	-	-	-	-	2007	3	397	26	3	477	80	3	0.80	0.02
4	2004	-	-	-	-	-	-	-	-	-	2005	1	438	-	1	620	-	1	0.70	-	2006	1	460	-	1	620	-	1	0.60	-
5	2003	-	-	-	-	-	-	-	-	-	2004	3	483	17	2	795	64	2	0.70	0.04	2005	7	467	27	7	743	113	7	0.70	0.05
6	2002	-	-	-	-	-	-	-	-	-	2003	6	517	29	6	892	186	6	0.60	0.05	2004	5	519	54	5	1032	347	5	0.70	0.09
7	2001	-	-	-	-	-	-	-	-	-	2002	15	517	56	13	985	238	13	0.70	0.04	2003	5	535	32	5	1040	201	5	0.70	0.04
8	2000	-	-	-	-	-	-	-	-	-	2001	9	570	39	9	1202	220	9	0.70	0.09	2002	8	532	41	8	1039	254	8	0.70	0.03
9	1999	-	-	-	-	-	-	-	-	-	2000	18	560	54	18	1197	302	18	0.70	0.08	2001	7	617	34	6	1670	133	6	0.80	0.05
10	1998	-	-	-	-	-	-	-	-	-	1999	25	591	59	24	1300	312	24	0.60	0.05	2000	6	604	52	6	1472	391	6	0.70	0.05
11	1997	-	-	-	-	-	-	-	-	-	1998	11	624	59	10	1547	471	10	0.60	0.09	1999	6	630	48	6	1977	550	6	0.80	0.10
12	1996	-	-	-	-	-	-	-	-	-	1997	5	636	49	5	1648	433	5	0.60	0.07	1998	5	645	50	5	1938	508	5	0.70	0.04
13	1995	-	-	-	-	-	-	-	-	-	1996	3	599	37	3	1607	224	3	0.70	0.07	1997	1	635	-	1	1840	-	1	0.70	-
14	1994	-	-	-	-	-	-	-	-	-	1995	2	588	122	2	1375	1039	2	0.60	0.13	1996	1	774	-	1	3440	-	1	0.70	-
15	1993	-	-	-	-	-	-	-	-	-	1994	1	666	-	1	2040	-	1	0.70	-	1995	-	-	-	-	-	-	-	-	-
16	1992	-	-	-	-	-	-	-	-	-	1993	1	636	-	1	1760	-	1	0.70	-	1994	-	-	-	-	-	-	-	-	-
17	1991	-	-	-	-	-	-	-	-	-	1992	1	722	-	1	2800	-	1	0.70	-	1993	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-20. continued.

Age	Gauer Lake																												
	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2006	4	329	15	4	245	37	4	0.70	0.04	2007	3	285	17	3	173	23	3	0.70	0.05	2008	1	353	-	1	284	-	1	0.70	-
3	2005	14	416	36	14	539	151	14	0.70	0.04	2006	3	327	18	3	253	42	3	0.70	0.03	2007	6	383	42	6	398	113	6	0.70	0.05
4	2004	15	484	59	15	791	254	15	0.70	0.08	2005	6	419	59	6	515	198	6	0.70	0.05	2006	9	456	35	9	647	147	9	0.70	0.06
5	2003	36	537	40	36	1069	228	36	0.70	0.06	2004	5	485	21	5	794	119	5	0.70	0.02	2005	13	516	41	13	893	194	13	0.60	0.07
6	2002	30	604	56	30	1497	380	30	0.70	0.05	2003	11	545	37	11	1076	171	11	0.70	0.07	2004	24	573	40	24	1239	305	24	0.60	0.05
7	2001	13	651	59	13	1925	512	13	0.70	0.04	2002	15	577	48	15	1296	371	15	0.70	0.08	2003	14	609	32	14	1483	416	14	0.60	0.11
8	2000	6	701	38	6	2342	387	6	0.70	0.07	2001	20	605	35	20	1447	221	20	0.70	0.04	2002	4	668	32	4	1835	358	4	0.60	0.06
9	1999	3	775	19	3	3360	459	3	0.70	0.05	2000	7	648	18	7	1780	257	7	0.70	0.05	2001	5	694	46	5	2568	447	5	0.80	0.07
10	1998	2	742	3	2	3780	42	2	0.90	0.03	1999	5	702	36	5	2250	437	5	0.70	0.09	2000	2	739	54	2	2525	601	2	0.60	0.01
11	1997	1	865	-	1	4650	-	1	0.70	-	1998	2	634	80	2	1730	523	2	0.70	0.06	1999	-	-	-	-	-	-	-	-	-
12	1996	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-	1998	-	-	-	-	-	-	-	-	-
13	1995	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-
14	1994	1	953	-	1	6900	-	1	0.80	-	1995	2	831	36	2	4325	247	2	0.80	0.14	1996	-	-	-	-	-	-	-	-	-
15	1993	1	925	-	1	6860	-	1	0.90	-	1994	-	-	-	-	-	-	-	-	-	1995	-	-	-	-	-	-	-	-	-
16	1992	-	-	-	-	-	-	-	-	-	1993	-	-	-	-	-	-	-	-	-	1994	1	1024	-	1	8700	-	1	0.80	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-21. Mean fork length- (mm), weight- (g), and condition factor- (K) at-age for Lake Whitefish captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

Age	Granville Lake																													
	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2006	8	202	21	8	116	42	8	1.40	0.08	2007	7	233	10	7	169	34	7	1.30	0.19	2008	2	173	1	2	70	14	2	1.40	0.24
3	2005	6	237	37	6	210	122	6	1.40	0.17	2006	8	257	12	8	258	41	8	1.50	0.14	2007	11	214	21	11	139	49	11	1.40	0.13
4	2004	-	-	-	-	-	-	-	-	-	2005	8	306	45	7	391	176	7	1.50	0.16	2006	8	294	36	8	385	153	8	1.40	0.20
5	2003	2	380	57	2	935	460	2	1.60	0.11	2004	2	350	3	2	740	28	2	1.70	0.03	2005	8	307	45	8	439	231	8	1.40	0.11
6	2002	-	-	-	-	-	-	-	-	-	2003	4	348	38	4	700	223	4	1.60	0.12	2004	4	343	56	4	465	58	4	1.20	0.42
7	2001	2	416	20	2	1220	297	2	1.70	0.18	2002	14	403	32	14	1135	281	14	1.70	0.15	2003	2	440	198	2	955	785	2	1.10	0.51
8	2000	2	397	47	2	1105	403	2	1.70	0.04	2001	7	430	13	7	1326	154	7	1.70	0.08	2002	8	410	19	8	1055	162	8	1.50	0.08
9	1999	1	482	-	1	1940	-	1	1.70	-	2000	3	432	26	3	1447	344	3	1.80	0.19	2001	1	432	-	1	1280	-	1	1.60	-
10	1998	-	-	-	-	-	-	-	-	-	1999	4	443	30	4	1478	307	4	1.70	0.04	2000	3	406	79	3	1047	690	3	1.40	0.09
11	1997	-	-	-	-	-	-	-	-	-	1998	3	443	38	3	1643	635	3	1.80	0.28	1999	-	-	-	-	-	-	-	-	-
12	1996	-	-	-	-	-	-	-	-	-	1997	3	450	13	3	1583	76	3	1.70	0.10	1998	1	464	-	1	1500	-	1	1.50	-
13	1995	-	-	-	-	-	-	-	-	-	1996	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-
14	1994	-	-	-	-	-	-	-	-	-	1995	2	462	28	2	1650	382	2	1.70	0.07	1996	-	-	-	-	-	-	-	-	-
15	1993	-	-	-	-	-	-	-	-	-	1994	2	475	18	2	1815	78	2	1.70	0.13	1995	-	-	-	-	-	-	-	-	-
16	1992	-	-	-	-	-	-	-	-	-	1993	-	-	-	-	-	-	-	-	-	1994	-	-	-	-	-	-	-	-	-
17	1991	-	-	-	-	-	-	-	-	-	1992	-	-	-	-	-	-	-	-	-	1993	-	-	-	-	-	-	-	-	-
18	1990	-	-	-	-	-	-	-	-	-	1991	-	-	-	-	-	-	-	-	-	1992	1	504	-	1	2080	-	1	1.60	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-21. continued.

Age	SIL-Area 1										SIL-Area 6									
	2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2007	2	209	47	2	170	85	2	1.80	0.28	2008	1	206	-	1	140	-	1	1.60	-
3	2006	5	199	16	5	106	30	5	1.30	0.09	2007	6	249	17	6	242	59	6	1.50	0.07
4	2005	8	280	42	7	279	56	7	1.50	0.13	2006	10	318	27	10	506	115	10	1.60	0.16
5	2004	3	308	33	3	497	176	3	1.60	0.09	2005	6	368	20	6	773	144	6	1.50	0.12
6	2003	7	385	29	7	986	273	7	1.70	0.16	2004	2	373	30	2	825	276	2	1.60	0.17
7	2002	17	405	24	17	1160	260	17	1.70	0.12	2003	1	430	-	1	1260	-	1	1.60	-
8	2001	10	423	39	10	1365	350	10	1.80	0.22	2002	-	-	-	-	-	-	-	-	-
9	2000	3	430	26	3	1450	420	3	1.80	0.21	2001	1	446	-	1	1310	-	1	1.50	-
10	1999	2	404	57	2	1115	559	2	1.60	0.17	2000	-	-	-	-	-	-	-	-	-
11	1998	5	484	55	5	1976	531	5	1.70	0.13	1999	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-21. continued.

Age	SIL-Area 4																													
	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2006	1	234	-	1	160	-	1	1.30	-	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2005	1	192	-	1	90	-	1	1.30	-	2006	1	178	-	1	70	-	1	1.20	-	2007	-	-	-	-	-	-	-	-	-
4	2004	12	218	25	12	134	50	12	1.30	0.10	2005	1	190	-	1	80	-	1	1.20	-	2006	1	215	-	1	110	-	1	1.10	-
5	2003	40	229	28	39	152	85	39	1.20	0.12	2004	1	242	-	1	200	-	1	1.40	-	2005	2	208	4	2	95	7	2	1.10	0.03
6	2002	24	258	50	24	254	226	24	1.30	0.15	2003	12	234	25	11	176	85	11	1.30	0.17	2004	4	235	38	4	155	81	4	1.10	0.08
7	2001	34	304	45	34	384	172	34	1.30	0.17	2002	7	252	29	7	207	74	7	1.30	0.08	2003	13	239	25	13	165	75	13	1.10	0.14
8	2000	144	318	35	143	432	147	143	1.30	0.12	2001	25	296	36	24	351	118	24	1.30	0.20	2002	9	248	18	8	176	37	8	1.20	0.08
9	1999	168	336	30	168	538	163	168	1.40	0.13	2000	41	315	27	41	410	129	41	1.30	0.13	2001	12	264	26	12	228	90	12	1.20	0.14
10	1998	45	367	26	45	708	166	45	1.40	0.07	1999	98	337	36	95	526	159	95	1.30	0.10	2000	17	312	35	17	385	128	17	1.20	0.12
11	1997	57	376	34	56	762	202	56	1.40	0.15	1998	15	361	28	15	630	172	15	1.30	0.15	1999	71	327	26	71	463	117	71	1.30	0.08
12	1996	46	390	22	46	866	193	46	1.40	0.14	1997	17	397	103	16	693	171	16	1.30	0.12	1998	11	361	18	11	602	86	11	1.30	0.07
13	1995	28	396	29	28	887	267	28	1.40	0.26	1996	15	384	29	15	779	173	15	1.40	0.12	1997	10	377	31	10	709	152	10	1.30	0.09
14	1994	15	413	22	15	1012	177	15	1.40	0.08	1995	6	407	26	5	838	193	5	1.30	0.11	1996	6	386	19	6	707	116	6	1.20	0.05
15	1993	8	384	21	8	831	163	8	1.50	0.08	1994	6	410	28	6	1010	273	6	1.40	0.12	1995	11	406	26	11	820	154	11	1.20	0.07
16	1992	3	429	26	3	1130	336	3	1.40	0.16	1993	4	396	14	4	903	94	4	1.50	0.10	1994	4	413	23	4	948	183	4	1.30	0.10
17	1991	-	-	-	-	-	-	-	-	-	1992	1	442	-	1	1040	-	1	1.20	-	1993	2	402	6	2	730	71	2	1.10	0.16
18	1990	2	385	24	2	835	191	2	1.40	0.07	1991	1	414	-	1	1120	-	1	1.60	-	1992	-	-	-	-	-	-	-	-	-
19	1989	2	429	13	2	1115	21	2	1.40	0.10	1990	3	424	32	3	1110	285	3	1.40	0.14	1991	1	410	-	1	820	-	1	1.20	-
20	1988	1	408	-	1	930	-	1	1.40	-	1989	-	-	-	-	-	-	-	-	-	1990	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-21. continued..

	Gauer Lake																													
Age	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2006	11	207	15	11	116	30	11	1.30	0.13	2007	4	208	31	4	130	61	4	1.40	0.06	2008	-	-	-	-	-	-	-	-	-
3	2005	12	224	23	12	151	55	12	1.30	0.21	2006	12	246	24	12	204	58	12	1.30	0.14	2007	1	283	-	1	284	-	1	1.30	-
4	2004	21	266	46	21	295	174	21	1.40	0.23	2005	6	287	30	6	320	106	6	1.30	0.15	2006	15	279	28	15	291	89	15	1.30	0.04
5	2003	13	317	43	13	489	231	13	1.40	0.18	2004	7	302	27	7	424	127	7	1.50	0.11	2005	12	299	29	12	385	142	12	1.40	0.10
6	2002	26	343	33	26	592	191	26	1.40	0.20	2003	4	354	18	4	640	110	4	1.40	0.04	2004	4	304	16	4	395	85	4	1.40	0.16
7	2001	38	370	38	38	775	285	38	1.50	0.12	2002	10	354	37	10	678	277	10	1.50	0.09	2003	10	368	35	10	739	242	10	1.40	0.09
8	2000	24	386	44	24	913	364	24	1.50	0.20	2001	11	368	41	11	797	296	11	1.50	0.13	2002	16	363	30	16	692	193	16	1.40	0.12
9	1999	18	395	28	18	939	247	18	1.50	0.17	2000	11	385	33	11	880	300	11	1.50	0.13	2001	6	401	38	6	965	292	6	1.50	0.10
10	1998	13	415	24	13	1107	215	13	1.50	0.14	1999	10	398	26	10	1003	194	10	1.60	0.09	2000	11	416	28	11	1115	255	11	1.50	0.10
11	1997	9	425	39	9	1211	311	9	1.60	0.09	1998	4	411	33	4	1080	280	4	1.50	0.10	1999	9	417	37	9	1129	399	9	1.50	0.18
12	1996	3	416	31	3	1060	272	3	1.50	0.14	1997	3	452	19	3	1463	212	3	1.60	0.07	1998	3	400	10	3	915	88	3	1.40	0.09
13	1995	4	461	22	4	1585	381	4	1.60	0.18	1996	1	445	-	1	1450	-	1	1.70	-	1997	2	453	40	2	1408	522	2	1.50	0.18
14	1994	6	429	12	6	1017	170	6	1.30	0.20	1995	4	431	36	4	1220	307	4	1.50	0.12	1996	1	430	-	1	1128	-	1	1.40	-
15	1993	5	454	12	5	1392	273	5	1.50	0.20	1994	4	451	11	4	1623	217	4	1.80	0.12	1995	1	435	-	1	1016	-	1	1.20	-
16	1992	1	440	-	1	1430	-	1	1.70	-	1993	3	452	24	3	1550	275	3	1.70	0.05	1994	1	434	-	1	1193	-	1	1.50	-
17	1991	1	451	-	1	1530	-	1	1.70	-	1992	4	433	20	4	1220	214	4	1.50	0.04	1993	5	456	27	5	1342	331	5	1.40	0.09
18	1990	2	468	25	2	1565	304	2	1.50	0.06	1991	1	495	-	1	1920	-	1	1.60	-	1992	2	399	11	2	896	35	2	1.40	0.06
19	1989	-	-	-	-	-	-	-	-	-	1990	-	-	-	-	-	-	-	-	-	1991	4	460	17	4	1418	143	4	1.50	0.20
20	1988	2	491	27	2	1750	424	2	1.50	0.13	1989	1	473	-	1	1710	-	1	1.60	-	1990	-	-	-	-	-	-	-	-	-
21	1987	-	-	-	-	-	-	-	-	-	1988	-	-	-	-	-	-	-	-	-	1989	-	-	-	-	-	-	-	-	-
22	1986	-	-	-	-	-	-	-	-	-	1987	2	461	11	2	1455	290	2	1.50	0.20	1988	-	-	-	-	-	-	-	-	-
23	1985	-	-	-	-	-	-	-	-	-	1986	1	458	-	1	1410	-	1	1.50	-	1987	-	-	-	-	-	-	-	-	-
27	1981	-	-	-	-	-	-	-	-	-	1982	-	-	-	-	-	-	-	-	-	1983	1	461	-	1	1327	-	1	1.40	-
30	1978	-	-	-	-	-	-	-	-	-	1979	-	-	-	-	-	-	-	-	-	1980	1	480	-	1	1498	-	1	1.40	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-22. Fork length- (mm), weight- (g), and condition factor- (K) at-age for Walleye captured in standard gang index gillnets set in Upper Churchill River Region waterbodies, 2008-2010.

Age	Granville Lake																													
	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2006	3	205	12	3	90	20	3	1.00	0.07	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2005	5	242	20	5	134	27	5	0.90	0.04	2006	-	-	-	-	-	-	-	-	-	2007	4	260	16	4	180	38	4	1.00	0.04
4	2004	-	-	-	-	-	-	-	-	-	2005	2	291	30	2	245	134	2	0.90	0.25	2006	25	259	31	24	189	80	24	1.00	0.10
5	2003	9	318	37	9	332	104	9	1.00	0.06	2004	-	-	-	-	-	-	-	-	-	2005	21	302	33	21	314	123	21	1.10	0.09
6	2002	7	343	26	7	441	78	7	1.10	0.08	2003	-	-	-	-	-	-	-	-	-	2004	-	-	-	-	-	-	-	-	-
7	2001	22	373	22	22	556	132	22	1.10	0.09	2002	-	-	-	-	-	-	-	-	-	2003	29	381	28	29	636	186	29	1.10	0.11
8	2000	3	395	36	3	697	172	3	1.10	0.03	2001	1	394	-	1	710	-	1	1.20	-	2002	32	397	29	31	723	186	31	1.10	0.11
9	1999	4	396	31	4	728	188	4	1.20	0.02	2000	-	-	-	-	-	-	-	-	-	2001	22	407	28	22	751	164	22	1.10	0.09
10	1998	10	411	17	10	766	100	10	1.10	0.06	1999	1	372	-	1	590	-	1	1.20	-	2000	3	430	18	3	890	161	3	1.10	0.12
11	1997	8	432	48	8	958	346	8	1.10	0.11	1998	1	452	-	1	1140	-	1	1.20	-	1999	2	456	37	2	1120	212	2	1.20	0.07
12	1996	8	410	21	8	806	167	8	1.20	0.08	1997	1	421	-	1	800	-	1	1.10	-	1998	4	418	36	4	863	218	4	1.20	0.04
13	1995	1	418	-	1	960	-	1	1.30	-	1996	-	-	-	-	-	-	-	-	-	1997	-	-	-	-	-	-	-	-	-
14	1994	5	415	22	5	828	202	5	1.10	0.16	1995	1	382	-	1	660	-	1	1.20	-	1996	7	431	32	7	903	249	7	1.10	0.11
15	1993	-	-	-	-	-	-	-	-	-	1994	1	451	-	1	1010	-	1	1.10	-	1995	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-22. continued.

Age	SIL-Area 1										SIL-Area 6									
	2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2006	1	204	-	1	110	-	1	1.30	-	2007	-	-	-	-	-	-	-	-	-
4	2005	-	-	-	-	-	-	-	-	-	2006	3	240	11	3	147	21	3	1.10	0.02
5	2004	1	324	-	1	370	-	1	1.10	-	2005	-	-	-	-	-	-	-	-	-
6	2003	3	348	7	3	503	38	3	1.20	0.05	2004	-	-	-	-	-	-	-	-	-
7	2002	1	328	-	1	450	-	1	1.30	-	2003	-	-	-	-	-	-	-	-	-
8	2001	2	366	51	2	530	170	2	1.10	0.10	2002	1	468	-	1	1050	-	1	1.00	-
9	2000	2	411	23	2	785	92	2	1.10	0.06	2001	-	-	-	-	-	-	-	-	-
10	1999	1	382	-	1	640	-	1	1.20	-	2000	1	444	-	1	930	-	1	1.10	-
11	1998	-	-	-	-	-	-	-	-	-	1999	-	-	-	-	-	-	-	-	-
12	1997	1	478	-	1	1340	-	1	1.20	-	1998	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-22. continued.

Age	SIL-Area 4																													
	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2006	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2005	-	-	-	-	-	-	-	-	-	2006	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-
4	2004	-	-	-	-	-	-	-	-	-	2005	-	-	-	-	-	-	-	-	-	2006	4	291	34	4	288	94	4	1.10	0.06
5	2003	-	-	-	-	-	-	-	-	-	2004	-	-	-	-	-	-	-	-	-	2005	3	325	25	3	393	93	3	1.10	0.02
6	2002	-	-	-	-	-	-	-	-	-	2003	-	-	-	-	-	-	-	-	-	2004	1	310	-	1	350	-	1	1.20	-
7	2001	-	-	-	-	-	-	-	-	-	2002	-	-	-	-	-	-	-	-	-	2003	3	413	27	3	950	174	3	1.30	0.03
8	2000	-	-	-	-	-	-	-	-	-	2001	-	-	-	-	-	-	-	-	-	2002	1	430	-	1	1060	-	1	1.30	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-22. continued.

Age	Gauer Lake																												
	2008										2009										2010									
	Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K			Year-Class	FL (mm)			W (g)			K		
		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD		n	Mean	SD	n	Mean	SD	n	Mean	SD
2	2006	-	-	-	-	-	-	-	-	-	2007	-	-	-	-	-	-	-	-	-	2008	-	-	-	-	-	-	-	-	-
3	2005	1	215	-	1	110	-	1	1.10	-	2006	2	228	11	2	115	7	2	1.00	0.08	2007	-	-	-	-	-	-	-	-	-
4	2004	2	314	8	2	300	28	2	1.00	0.03	2005	2	231	10	2	125	21	2	1.00	0.04	2006	1	224	-	1	123	-	1	1.10	-
5	2003	8	302	23	8	294	83	8	1.10	0.14	2004	4	247	18	4	152	37	4	1.00	0.12	2005	4	276	29	4	227	69	4	1.10	0.12
6	2002	14	327	30	14	381	109	14	1.10	0.07	2003	1	240	-	1	130	-	1	0.90	-	2004	2	329	69	2	406	267	2	1.00	0.08
7	2001	15	363	36	15	547	166	15	1.10	0.12	2002	7	327	17	7	394	55	7	1.10	0.05	2003	11	347	16	11	453	57	11	1.10	0.07
8	2000	22	383	22	22	628	127	22	1.10	0.09	2001	12	349	30	12	457	126	12	1.10	0.03	2002	13	372	24	13	553	107	13	1.10	0.07
9	1999	12	395	28	12	731	146	12	1.20	0.07	2000	16	365	28	16	540	128	16	1.10	0.08	2001	11	382	22	11	622	108	11	1.10	0.07
10	1998	22	432	29	22	892	188	22	1.10	0.09	1999	32	393	28	32	682	154	32	1.10	0.06	2000	20	399	30	20	702	172	20	1.10	0.09
11	1997	19	444	34	19	980	211	19	1.10	0.09	1998	8	404	14	8	725	167	8	1.10	0.20	1999	11	411	26	11	793	156	11	1.10	0.07
12	1996	7	453	36	7	1093	309	7	1.10	0.08	1997	6	425	12	6	853	94	6	1.10	0.07	1998	11	422	30	11	827	184	11	1.10	0.10
13	1995	-	-	-	-	-	-	-	-	-	1996	12	445	26	12	1018	180	12	1.10	0.07	1997	8	444	39	8	1000	267	8	1.10	0.08
14	1994	-	-	-	-	-	-	-	-	-	1995	15	454	51	15	1047	322	15	1.10	0.12	1996	9	438	52	9	967	303	9	1.10	0.18
15	1993	-	-	-	-	-	-	-	-	-	1994	7	438	33	7	927	252	7	1.10	0.05	1995	5	434	28	5	952	273	5	1.10	0.11
16	1992	1	452	-	1	1090	-	1	1.20	-	1993	1	417	-	1	750	-	1	1.00	-	1994	1	452	-	1	961	-	1	1.00	-
17	1991	-	-	-	-	-	-	-	-	-	1992	-	-	-	-	-	-	-	-	-	1993	-	-	-	-	-	-	-	-	-
18	1990	-	-	-	-	-	-	-	-	-	1991	-	-	-	-	-	-	-	-	-	1992	-	-	-	-	-	-	-	-	-
19	1989	-	-	-	-	-	-	-	-	-	1990	1	532	-	1	1400	-	1	0.90	-	1991	-	-	-	-	-	-	-	-	-

FL = fork length; W = weight; K = condition factor

n = number of fish measured (may not equal number of fish caught); SD = standard deviation (unable to calculate for species and/or mesh sizes where only bulk weights were recorded)

Table 5.3.7-23. Deformities, erosion, lesions, and tumours (DELTs) summary for select fish species captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

Species	Deformities		Erosions		Lesions		Tumours		Total		
	n[1]	%[2]	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTS}	$\%_{DELTS}$
Granville Lake											
White Sucker	-	-	1	0.18	1	0.18	-	-	567	2	0.35
Northern Pike	-	-	-	-	-	-	-	-	136	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	88	-	-
Sauger	-	-	-	-	-	-	-	-	54	-	-
Walleye	-	-	-	-	1	0.41	-	-	245	1	0.41
Total	-	-	1	0.09	2	0.18	-	-	1090	3	0.28
SIL-Area 1											
White Sucker	-	-	-	-	-	-	-	-	24	-	-
Northern Pike	-	-	-	-	-	-	-	-	43	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	63	-	-
Sauger	-	-	-	-	-	-	-	-	0	-	-
Walleye	-	-	-	-	-	-	-	-	12	-	-
Total	-	-	-	-	-	-	-	-	142	-	-
SIL-Area 6											
White Sucker	-	-	1	2.38	-	-	-	-	42	1	2.38
Northern Pike	-	-	-	-	-	-	-	-	26	-	-
Lake Whitefish	-	-	-	-	-	-	-	-	28	-	-
Sauger	-	-	-	-	-	-	-	-	154	-	-
Walleye	-	-	-	-	-	-	-	-	5	-	-
Total	-	-	1	0.39	-	-	-	-	255	1	0.39
SIL-Area 4											
White Sucker	-	-	-	-	-	-	-	-	20	-	-
Northern Pike	-	-	-	-	-	-	-	-	324	-	-
Lake Whitefish	-	-	1	0.09	-	-	-	-	1067	1	0.09
Sauger	-	-	-	-	-	-	-	-	2	-	-
Walleye	-	-	-	-	-	-	-	-	12	-	-
Total	-	-	1	0.07	-	-	-	-	1425	1	0.07

n = number of inspected fish with DELTs;
$n_{Inspect}$ = total number of fish inspected for DELTs;
n_{DELTs} = total number of fish with DELTs;
% = percentage of inspected fish with DELTs ($n/n_{Inspect} \times 100$);
$\%_{DELTs}$ = total percentage of inspected fish with DELTs ($n_{DELTs}/n_{Inspect} \times 100$)

Table 5.3.7-23. continued.

Species	Deformities		Erosions		Lesions		Tumours		Total		
	n[1]	%[2]	n	%	n	%	n	%	$n_{Inspect}$	n_{DELTS}	$\%_{DELTS}$
Gauer Lake											
White Sucker	7	1.16	-	-	3	0.50	3	0.50	604	13	2.15
Northern Pike	-	-	-	-	1	0.30	1	0.30	328	2	0.61
Lake Whitefish	-	-	-	-	2	0.41	-	-	489	2	0.41
Sauger	-	-	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	1	0.22	-	-	447	1	0.22
Total	7	0.37	-	-	7	0.37	4	0.21	1868	18	0.96

n = number of inspected fish with DELTs;
$n_{Inspect}$ = total number of fish inspected for DELTs;
n_{DELTs} = total number of fish with DELTs;
% = percentage of inspected fish with DELTs ($n/n_{Inspect} \times 100$);
$\%_{DELTs}$ = total percentage of inspected fish with DELTs ($n_{DELTs}/n_{Inspect} \times 100$)

Table 5.3.7-24. Upper Churchill River Region Index of Biotic Integrity (IBI) values, 2008-2010.

Metric	Non standardized values										
	Granville			SIL-1	SIL-6	SIL-4			Gauer		
	2008	2009	2010	2009	2010	2008	2009	2010	2008	2009	2010
Number of species	12	14	14	11	12	9	8	10	13	11	12
Number of sensitive species	2	3	3	2	2	2	2	2	2	2	2
Proportion of tolerant individuals	50.2	53.0	47.7	18.6	11.1	23.4	34.2	34.0	20.0	22.6	19.2
Number of Insectivore species	7	10	9	6	7	5	4	5	10	7	8
Hill's Evenness Index	5.70	5.86	6.29	7.73	5.57	4.77	4.65	5.21	8.29	7.52	7.89
Insectivore biomass	2.4	9.8	5.8	35.1	29.7	40.2	25.9	23.1	22.0	19.0	18.5
Omnivore biomass	80.1	73.2	70.7	25.9	34.8	26.6	40.8	47.7	40.8	39.4	36.6
Piscivore biomass	17.5	17.0	23.6	39.1	35.4	33.2	33.3	29.2	37.1	41.6	44.9
Proportion lithophilic spawners	0.81	0.80	0.82	0.85	0.87	0.91	0.91	0.92	0.54	0.57	0.60
CPUE	85.9	73.5	76.6	32.2	35.6	84.4	54.5	35.1	79.9	59.9	61.1
% individuals with DELTS	0.00	0.00	0.35	0.00	0.78	0.00	0.00	0.40	1.94	0.41	0.76
	IBI Scores										
Number of species	6.0	7.0	7.0	5.5	6.0	4.5	4.0	5.0	6.5	5.5	6.0
Number of sensitive species	2.4	3.6	3.6	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Proportion of tolerant individuals	1.5	1.0	1.9	6.8	8.1	6.0	4.2	4.2	6.6	6.2	6.7
Number of Insectivore species	5.3	7.5	6.8	4.5	5.3	3.8	3.0	3.8	7.5	5.3	6.0
Hill's Evenness Index	5.0	5.1	5.5	6.7	4.8	4.1	4.0	4.5	7.2	6.5	6.9
Insectivore biomass	0.4	1.8	1.0	6.3	5.3	7.2	4.7	4.2	4.0	3.4	3.3
Omnivore biomass	0.0	0.0	0.0	6.1	4.8	6.0	3.9	2.8	3.9	4.1	4.5
Piscivore biomass	1.8	1.7	2.4	3.9	3.5	3.3	3.3	2.9	3.7	4.2	4.5
Proportion lithophilic spawners	8.1	8.0	8.2	8.5	8.7	9.1	9.1	9.2	5.4	5.7	6.0
CPUE	8.6	7.3	7.7	3.2	3.6	8.4	5.5	3.5	8.0	6.0	6.1
% individuals with DELTS	5.0	5.0	4.8	5.0	4.6	5.0	5.0	4.8	4.0	4.8	4.6
Total IBI	44.0	48.0	48.8	59.0	57.1	59.9	49.1	47.4	59.2	54.1	57.0

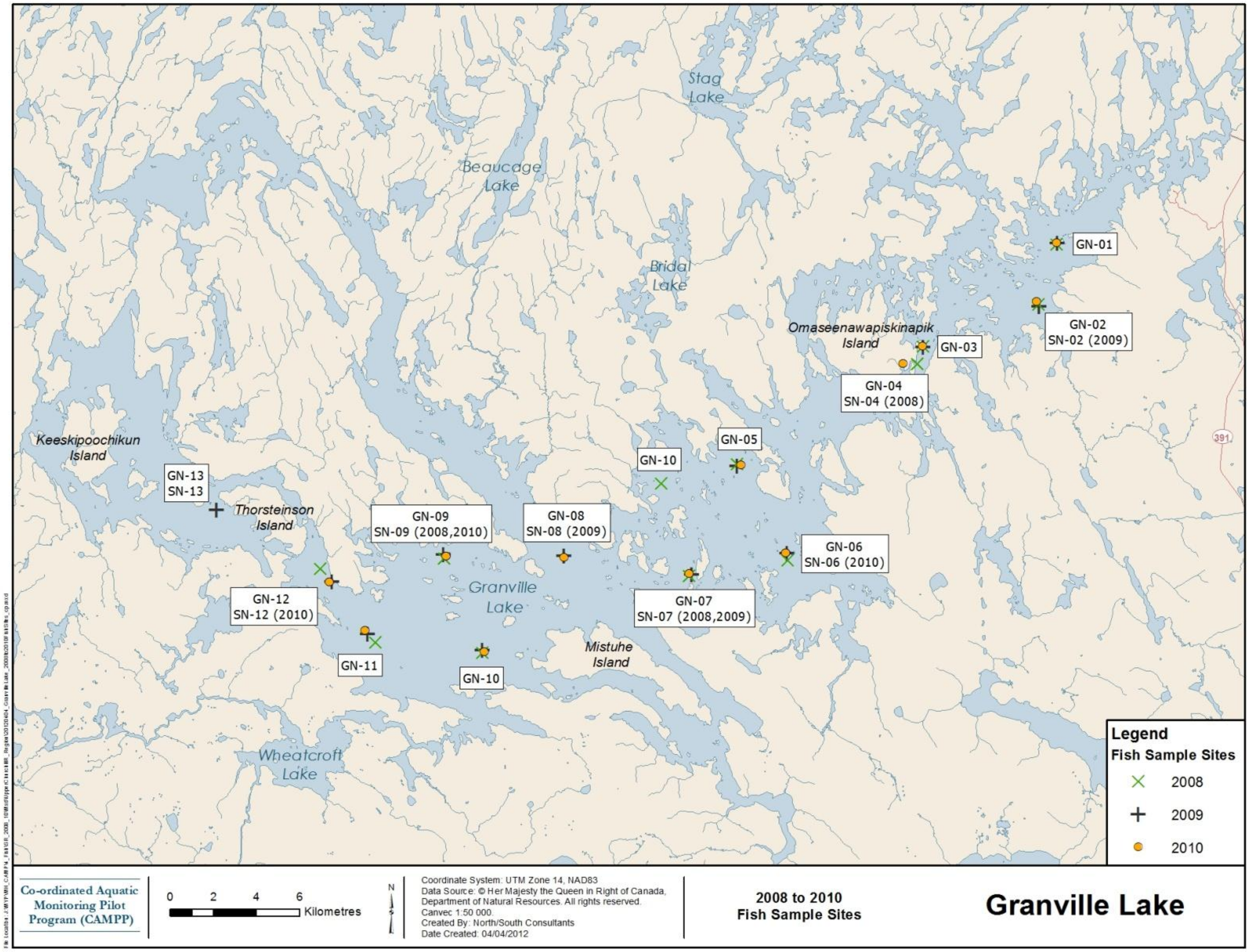


Figure 5.3.7-1. Map depicting standard gang and small mesh index gillnet sites sampled in Granville Lake, 2009-2010.

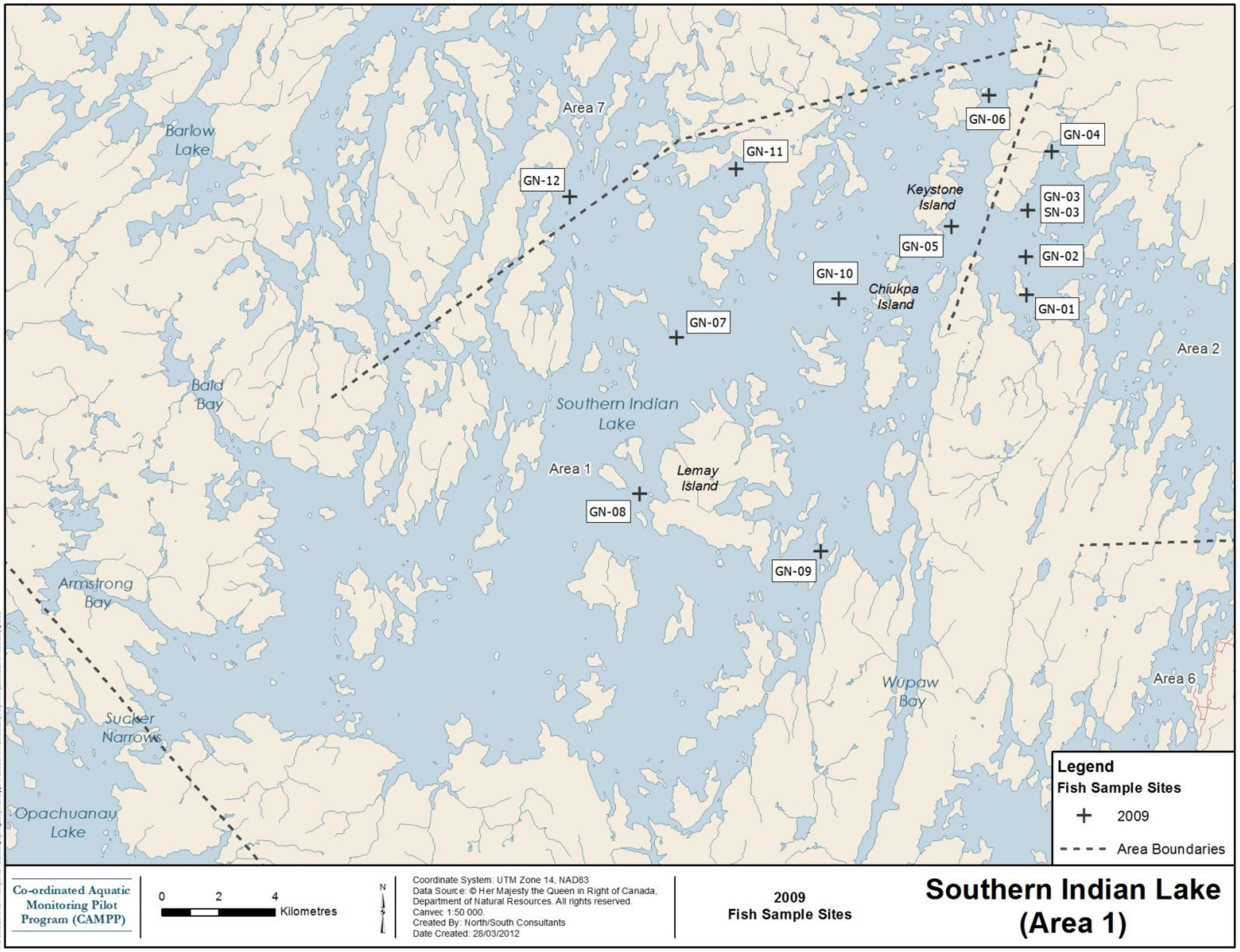


Figure 5.3.7-2. Map depicting standard gang and small mesh index gillnet sites sampled in Southern Indian Lake – Area 1, 2009.

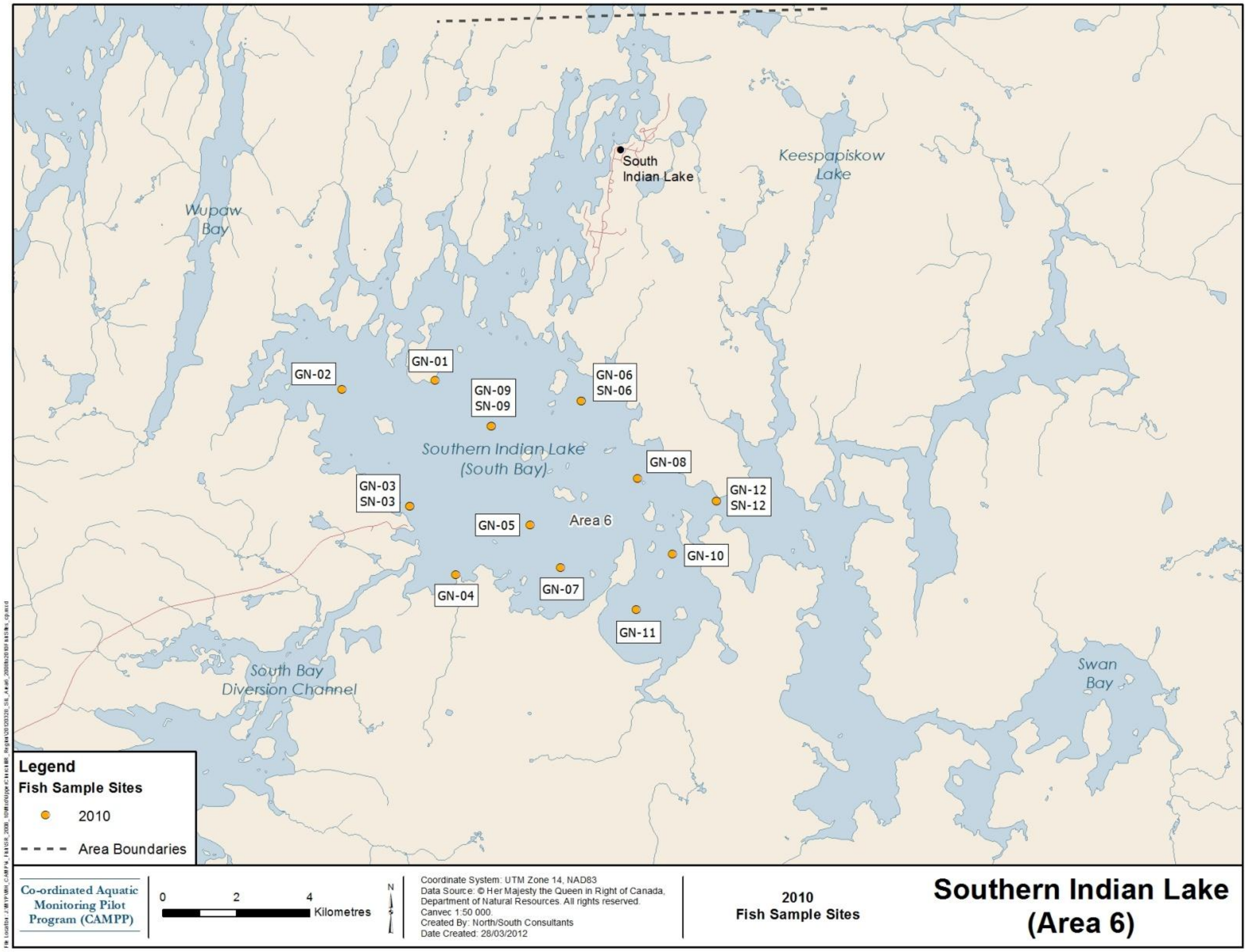


Figure 5.3.7-3. Map depicting standard gang and small mesh index gillnet sites sampled in Southern Indian Lake – Area 6, 2010.

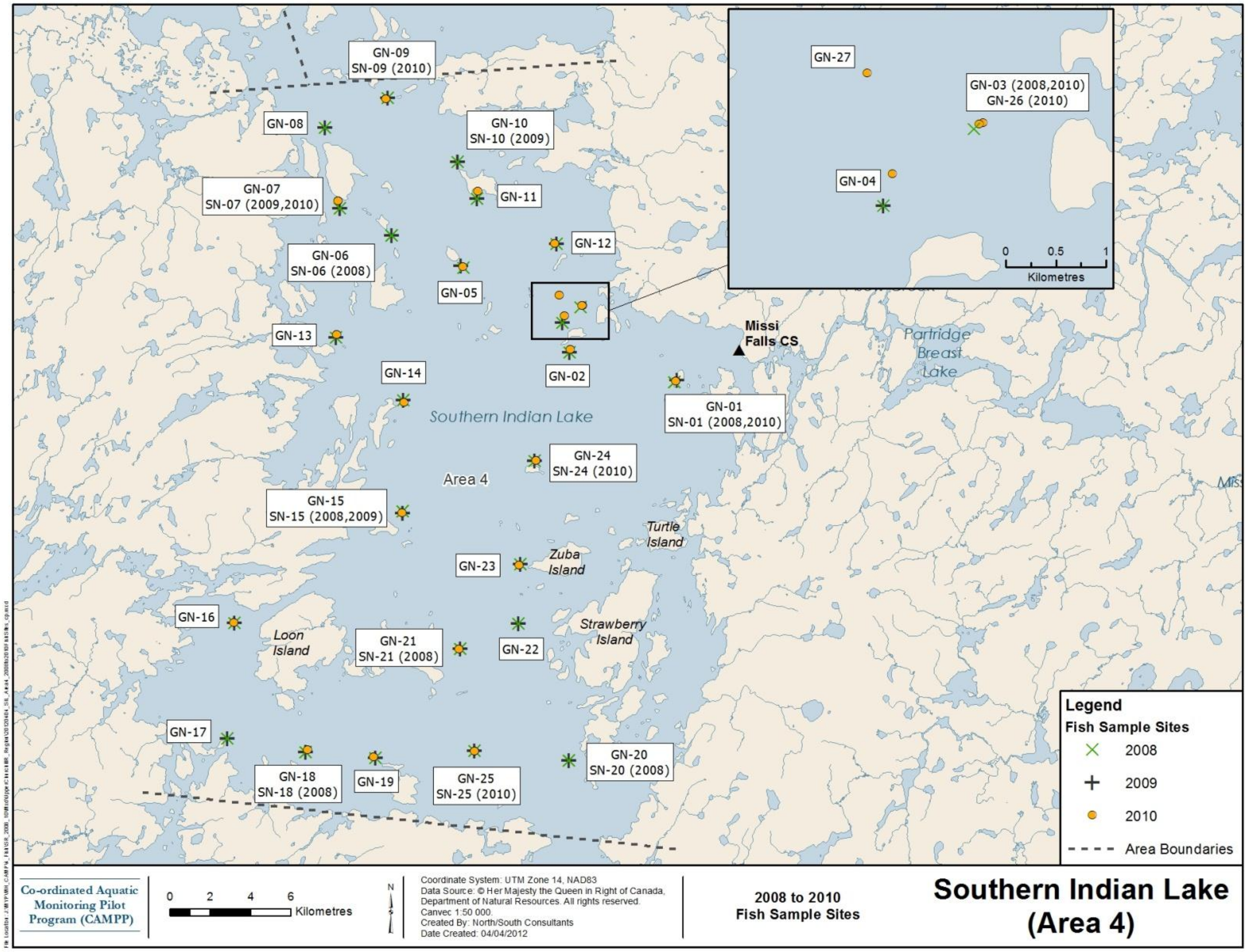


Figure 5.3.7-4. Map depicting standard gang and small mesh index gillnet sites sampled in Southern Indian Lake – Area 4, 2008-2010.

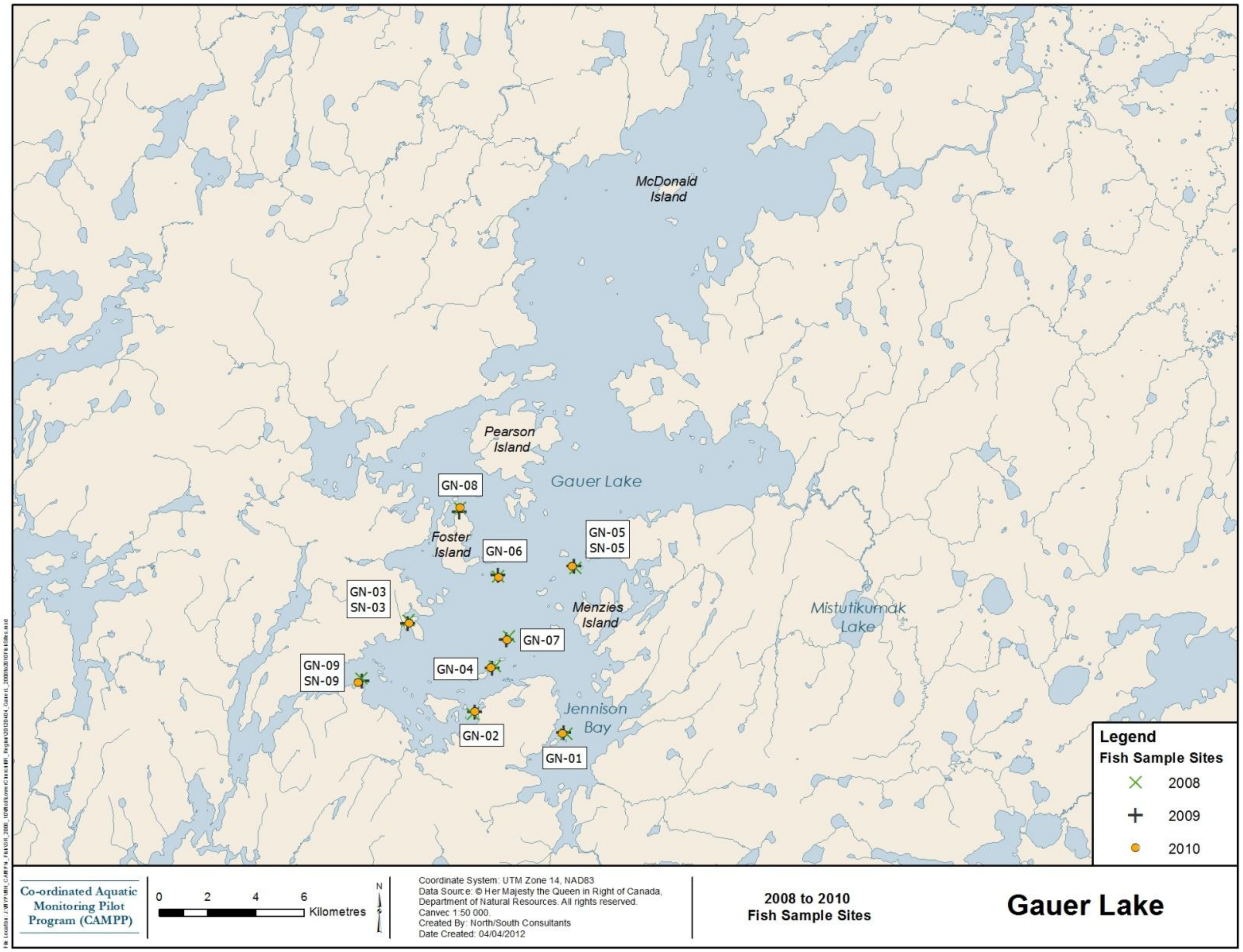


Figure 5.3.7-5. Map depicting standard gang and small mesh index gillnet sites sampled in Gauer Lake, 2008-2010.

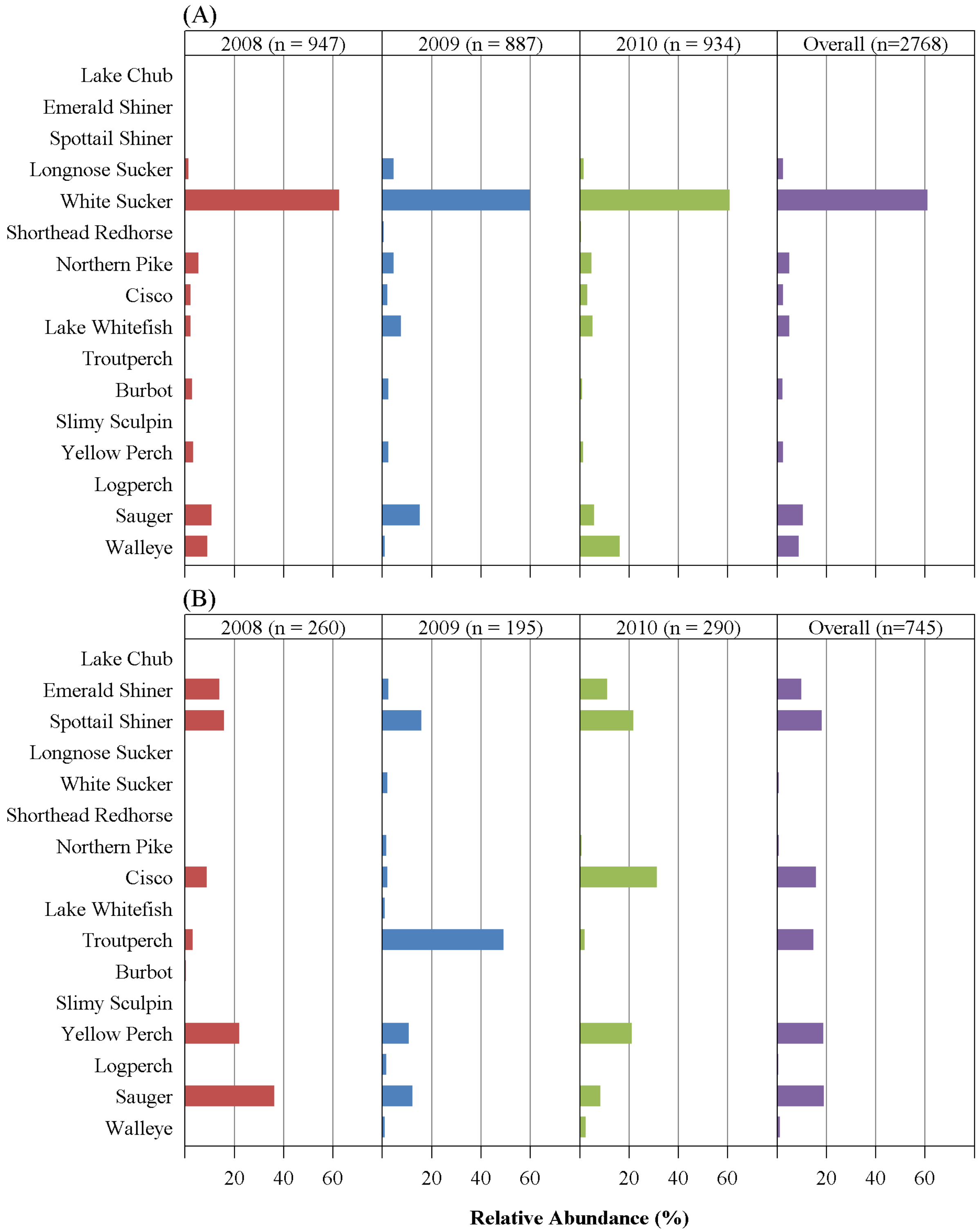


Figure 5.3.7-6. Relative abundance (%) distribution for fish species captured in: (A) standard gang and (B) small mesh index gill nets set on Granville Lake from 2008-2010.

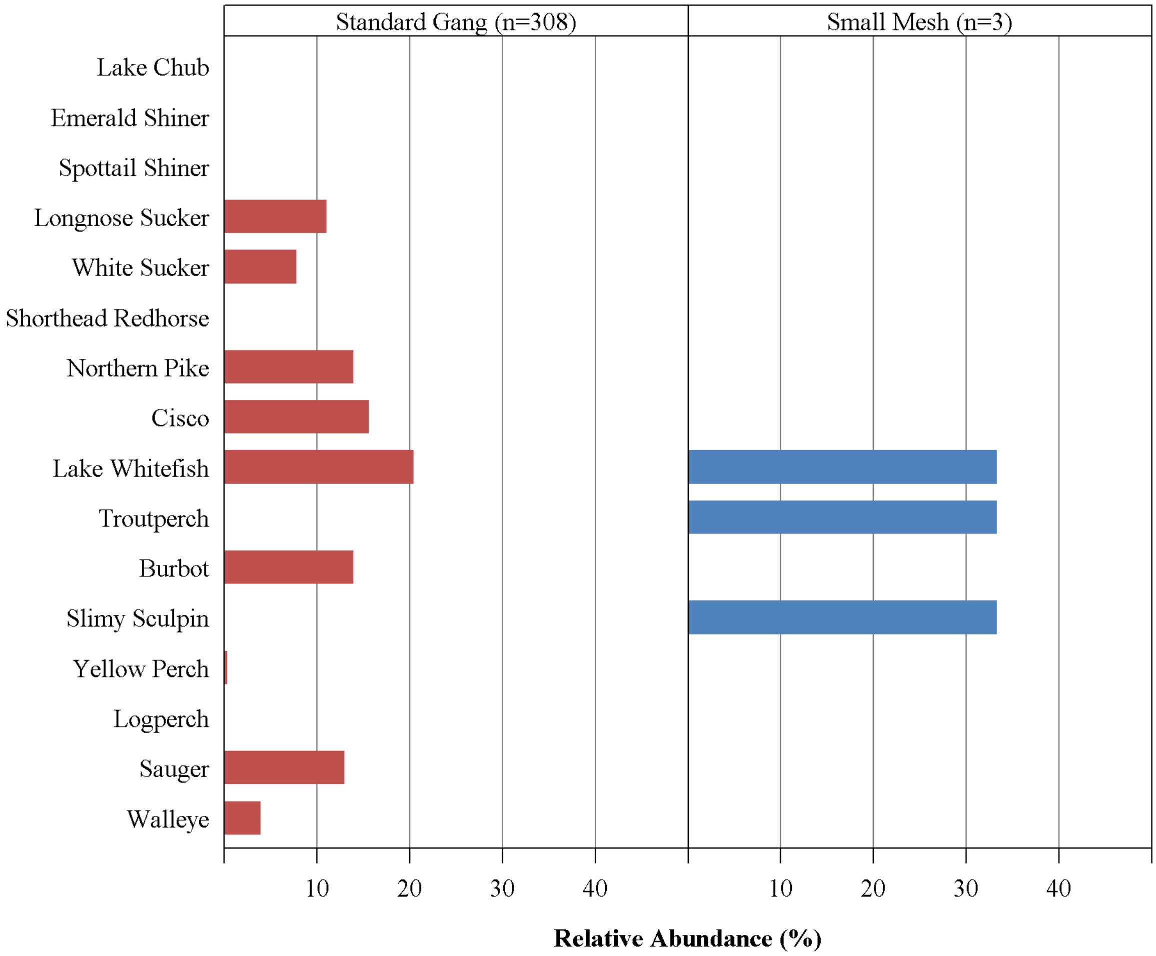


Figure 5.3.7-7. Relative abundance (%) distribution for fish species captured in standard gang and small mesh index gill nets set on Southern Indian Lake – Area 1 in 2009.

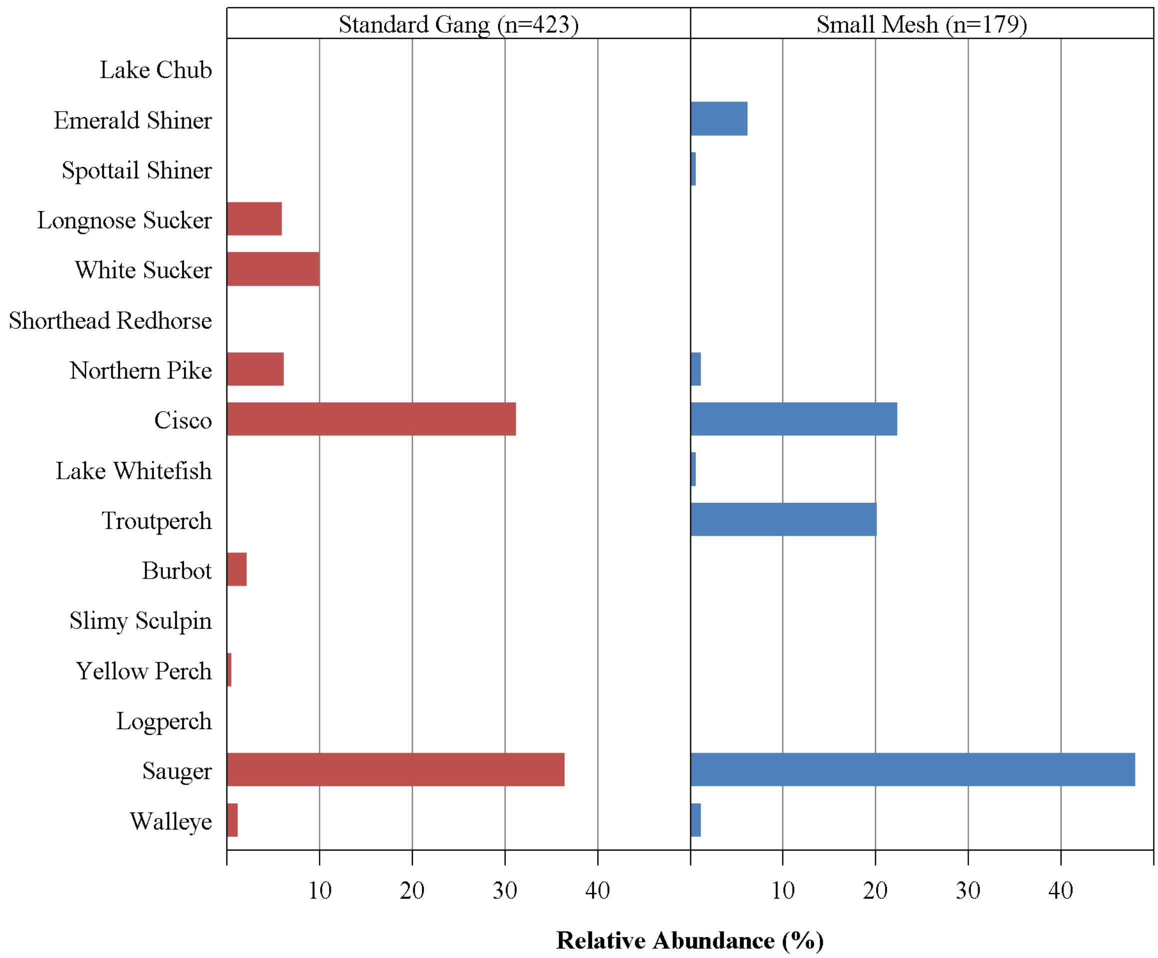


Figure 5.3.7-8. Relative abundance (%) distribution for fish species captured in standard gang and small mesh index gill nets set on Southern Indian Lake – Area 6 in 2010.

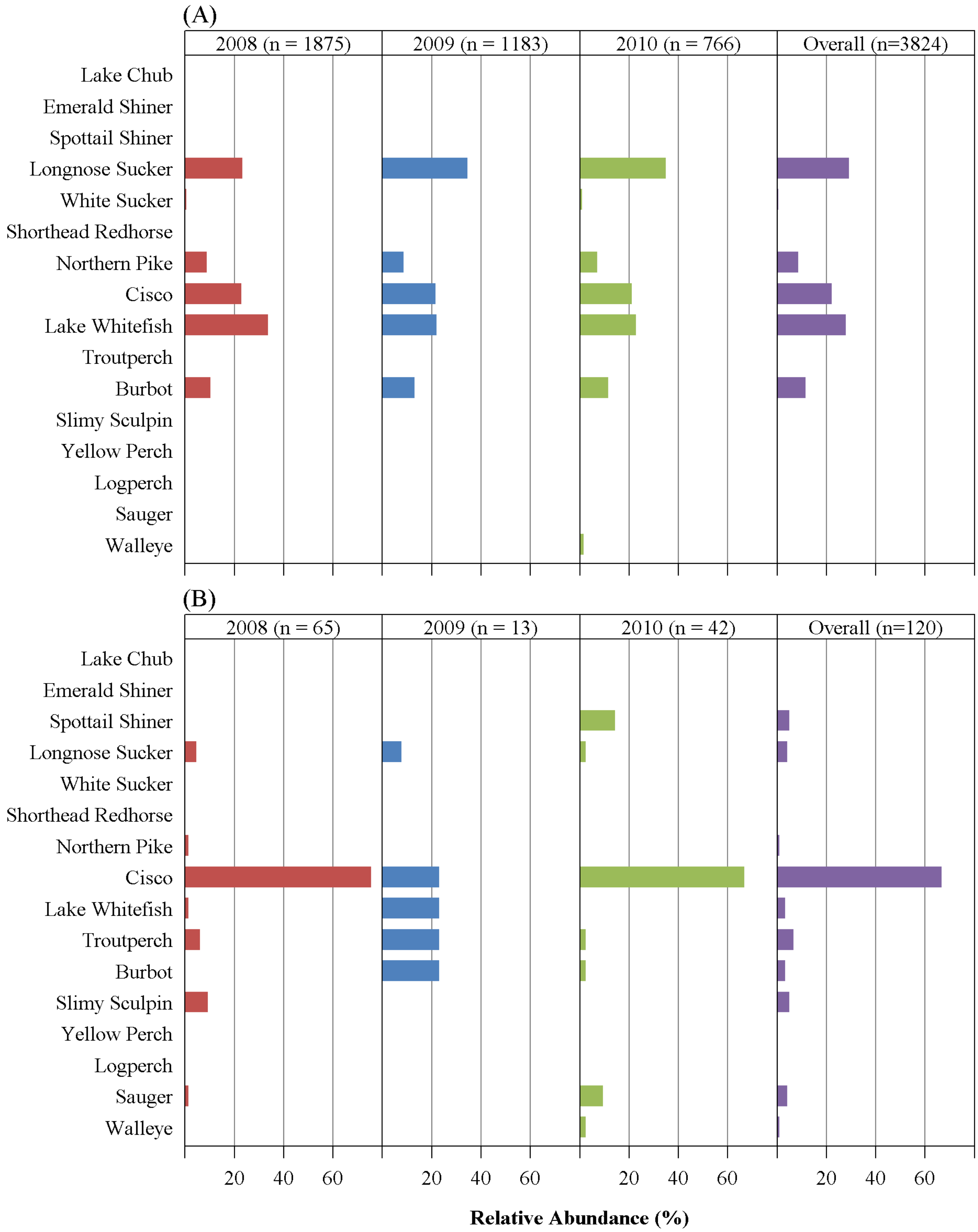


Figure 5.3.7-9. Relative abundance (%) distribution for fish species captured in: (A) standard gang and (B) small mesh index gill nets set on Southern Indian Lake – Area 4 from 2008-2010.

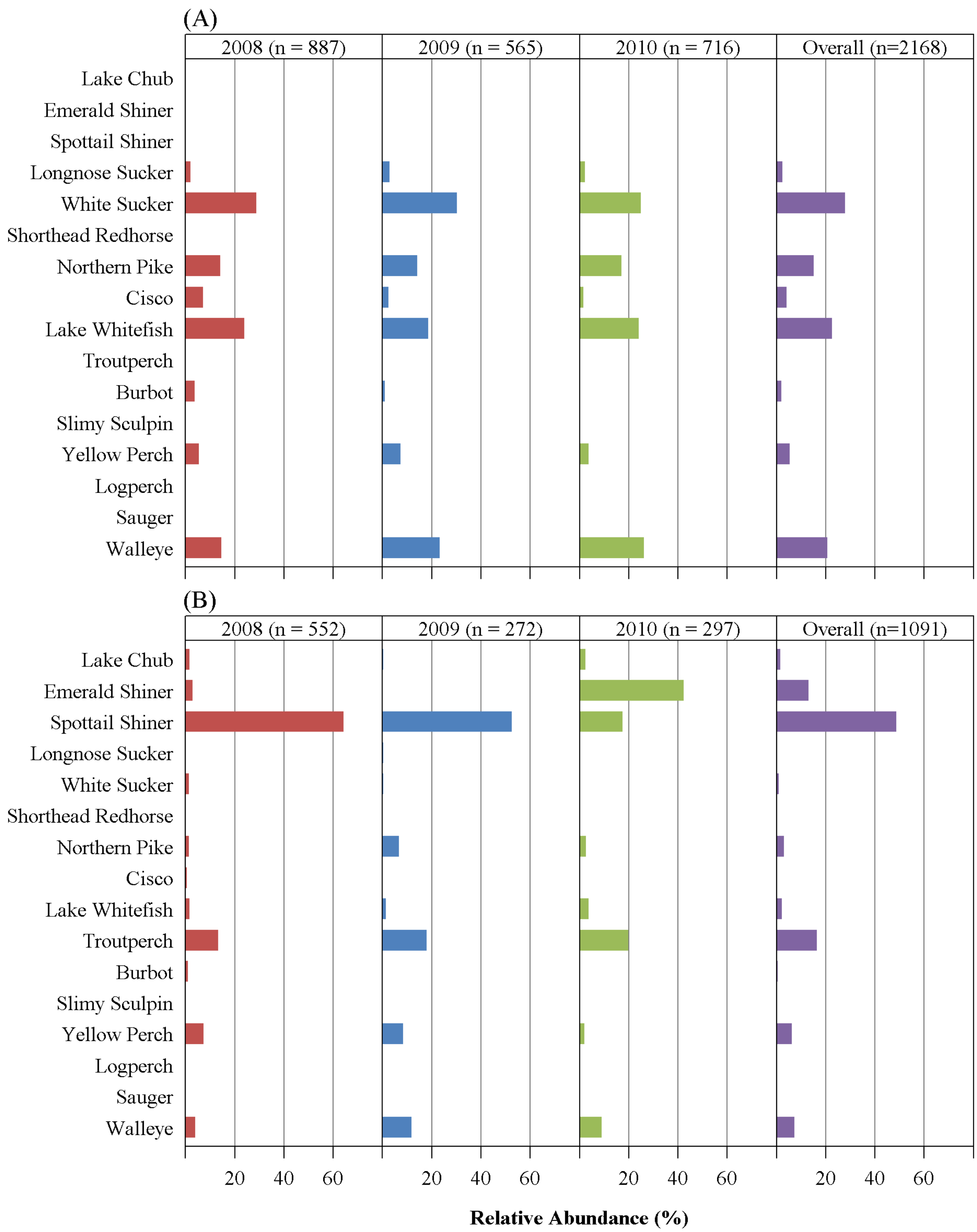


Figure 5.3.7-10. Relative abundance (%) distribution for fish species captured in: (A) standard gang and (B) small mesh index gill nets set on Gauer Lake from 2008-2010.

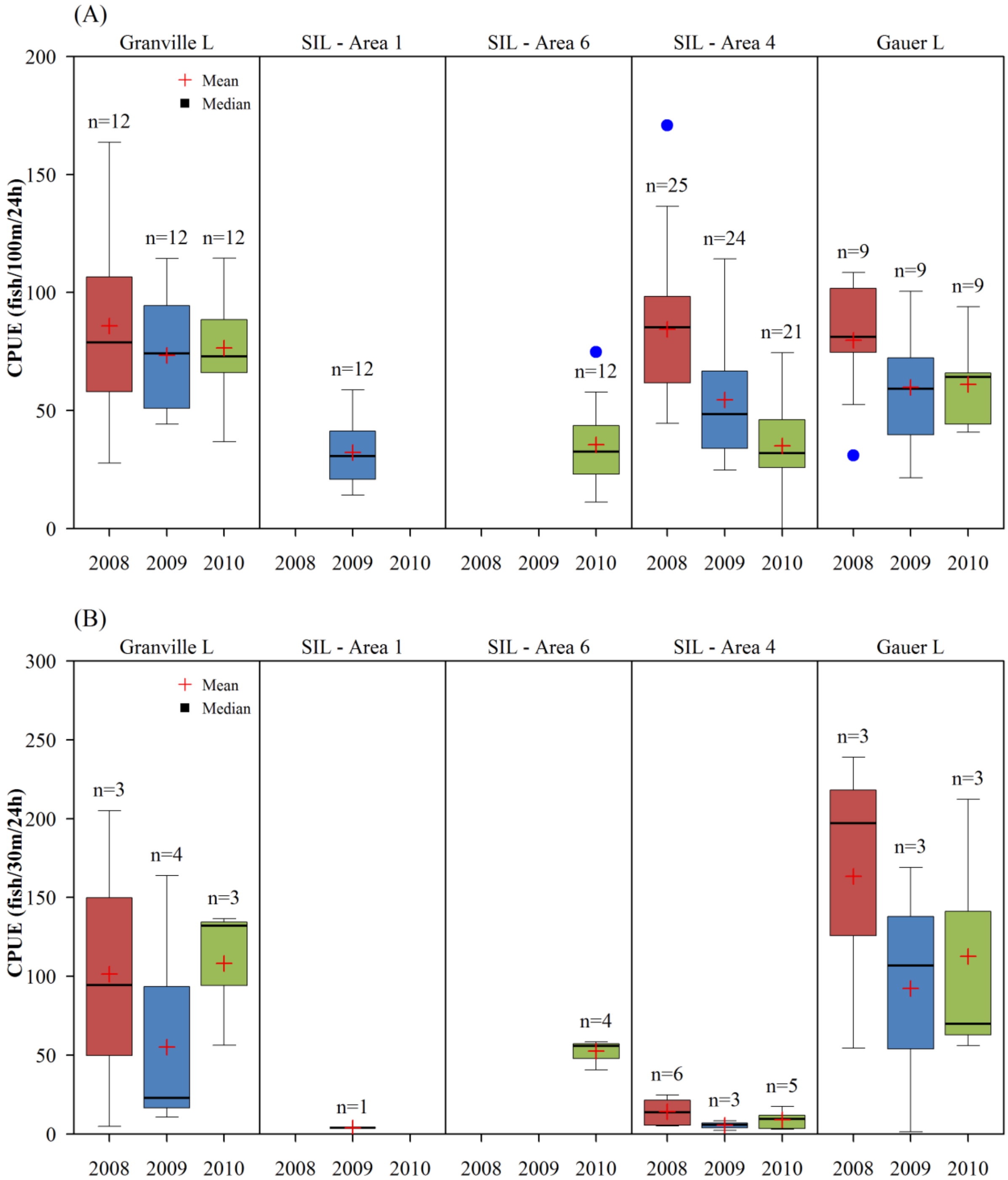


Figure 5.3.7-11. Mean and median total CPUE per site calculated for fish captured in (A) standard gang (B) small mesh index fill nets set in Upper Churchill River Region waterbodies, 2008-2010.

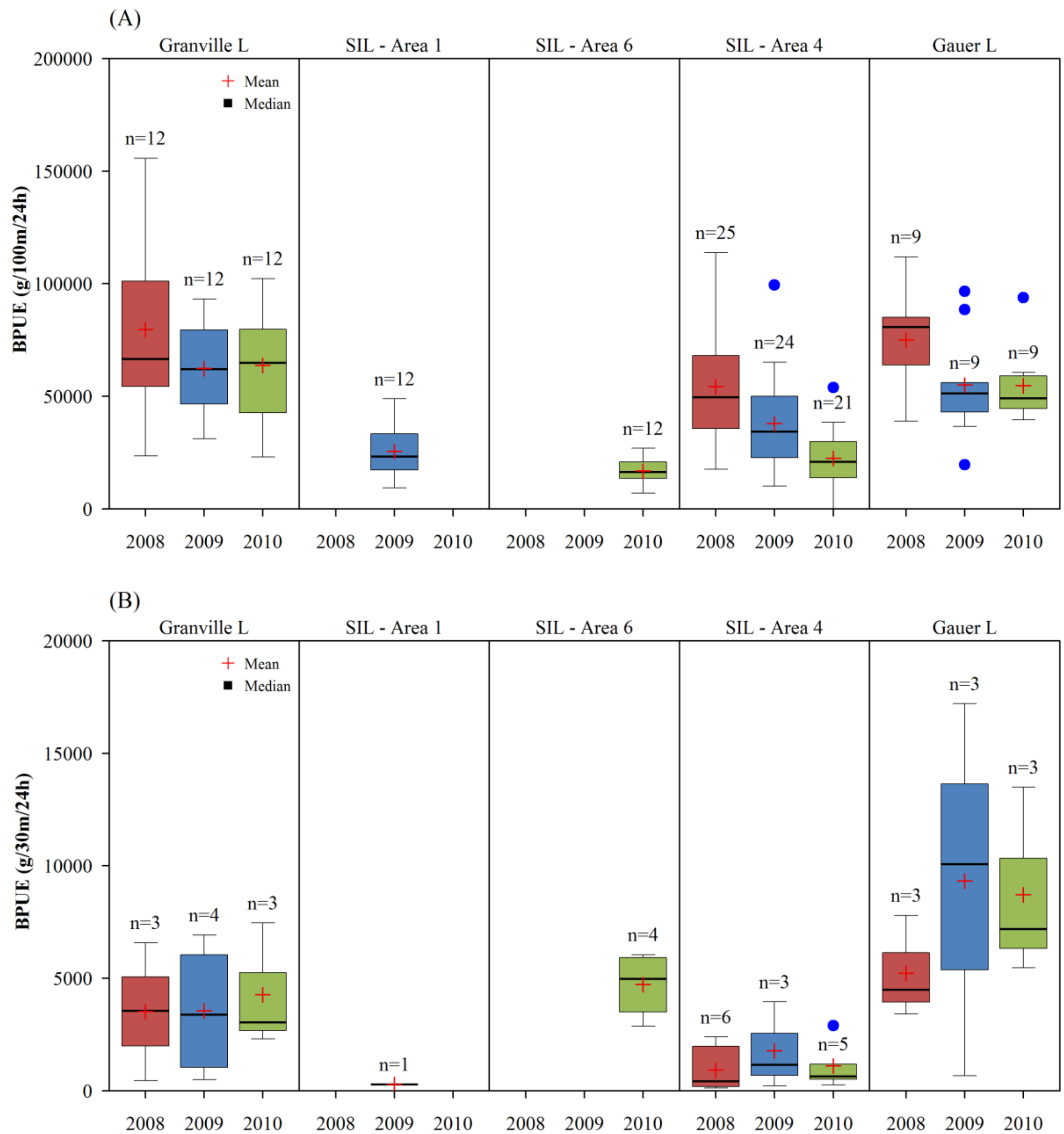


Figure 5.3.7-12. Mean and median total BPUE per site calculated for fish captured in (A) standard gang (B) small mesh index fill nets set in Upper Churchill River Region waterbodies, 2008-2010.

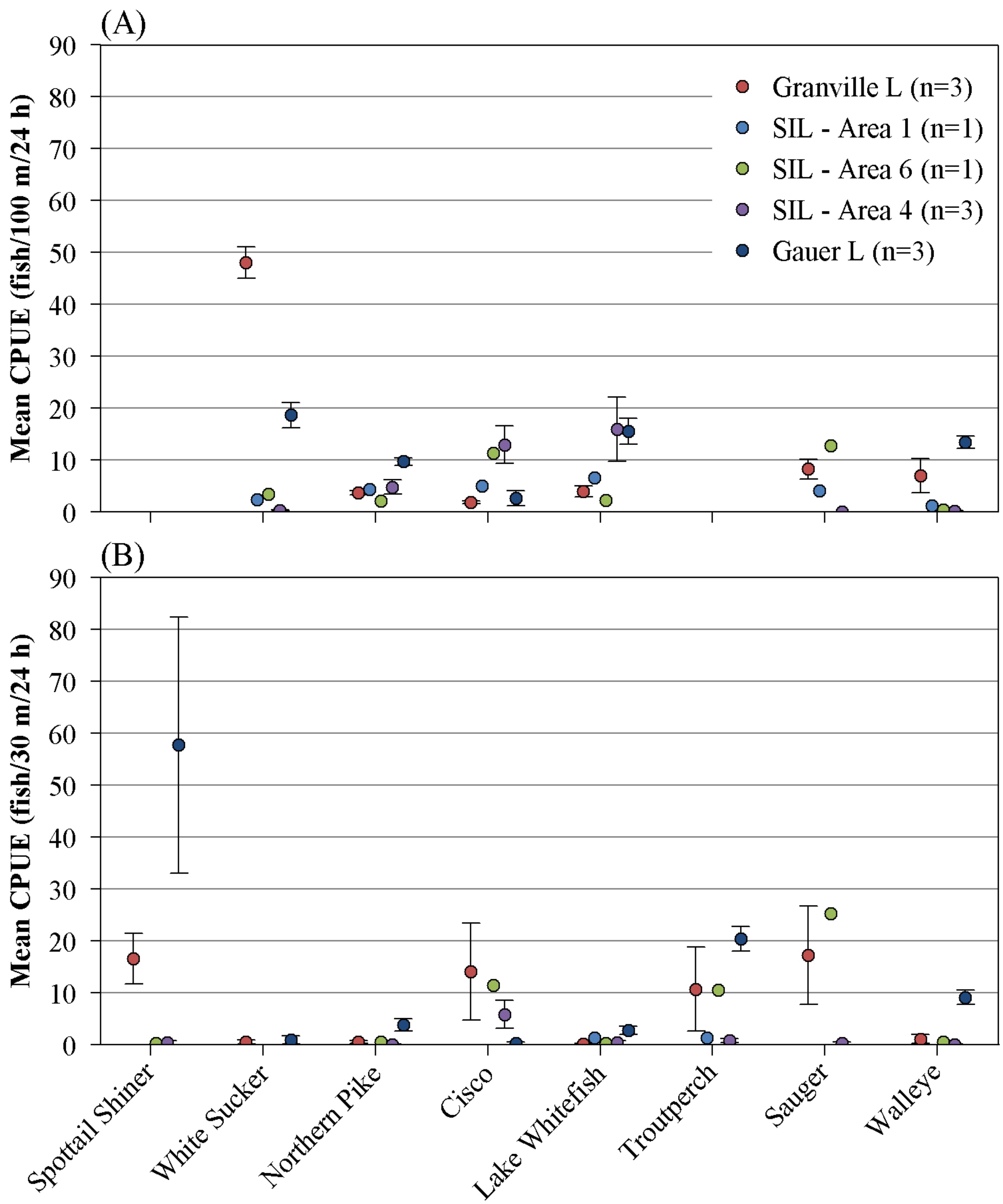


Figure 5.3.7-13. Mean (SE) CPUE for select species captured in (A) standard gang (B) small mesh index fill nets set in Upper Churchill River Region waterbodies, 2008-2010.

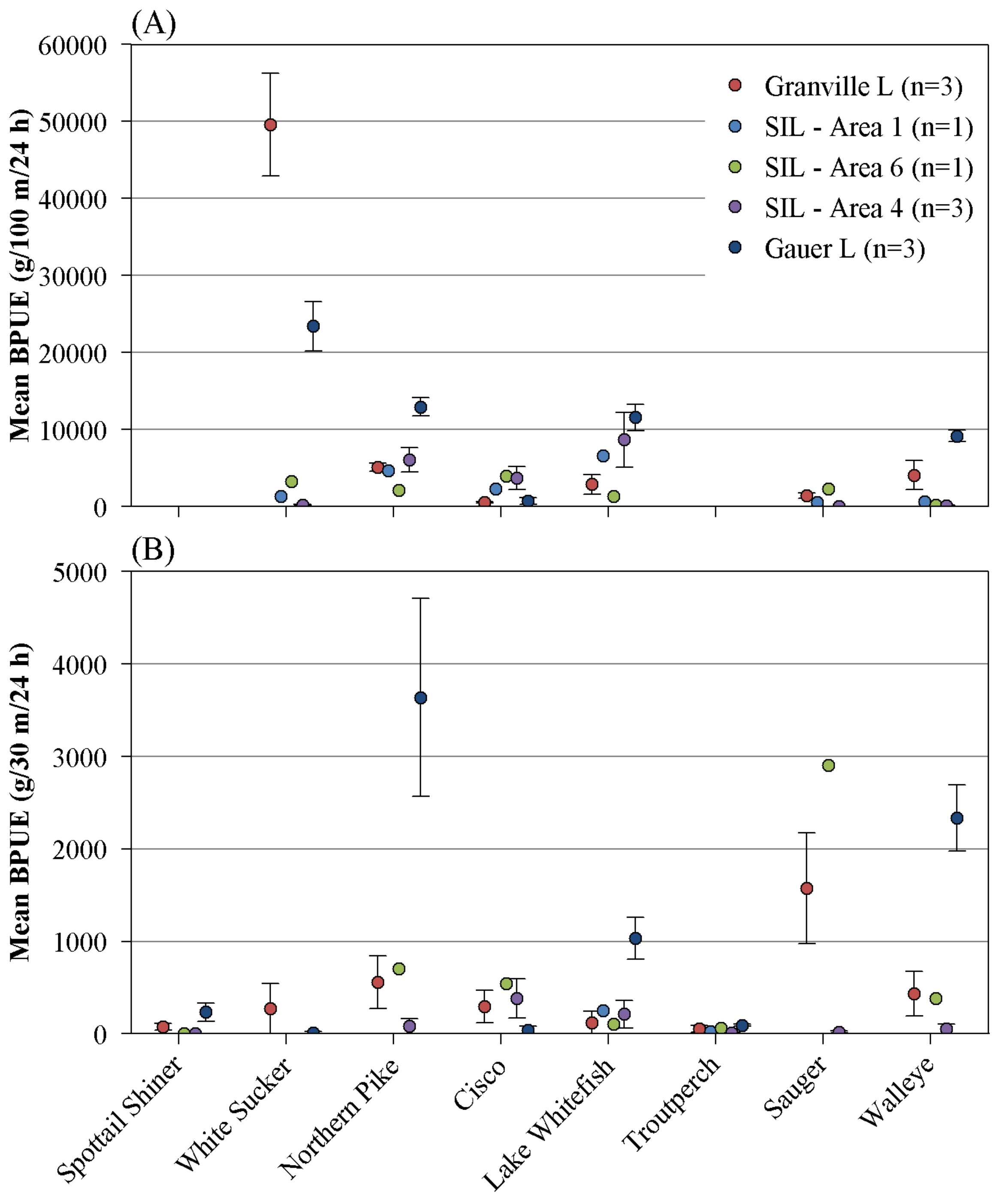


Figure 5.3.7-14. Mean (SE) BPUE for select species captured in (A) standard gang (B) small mesh index fill nets set in Upper Churchill River Region waterbodies, 2008-2010.

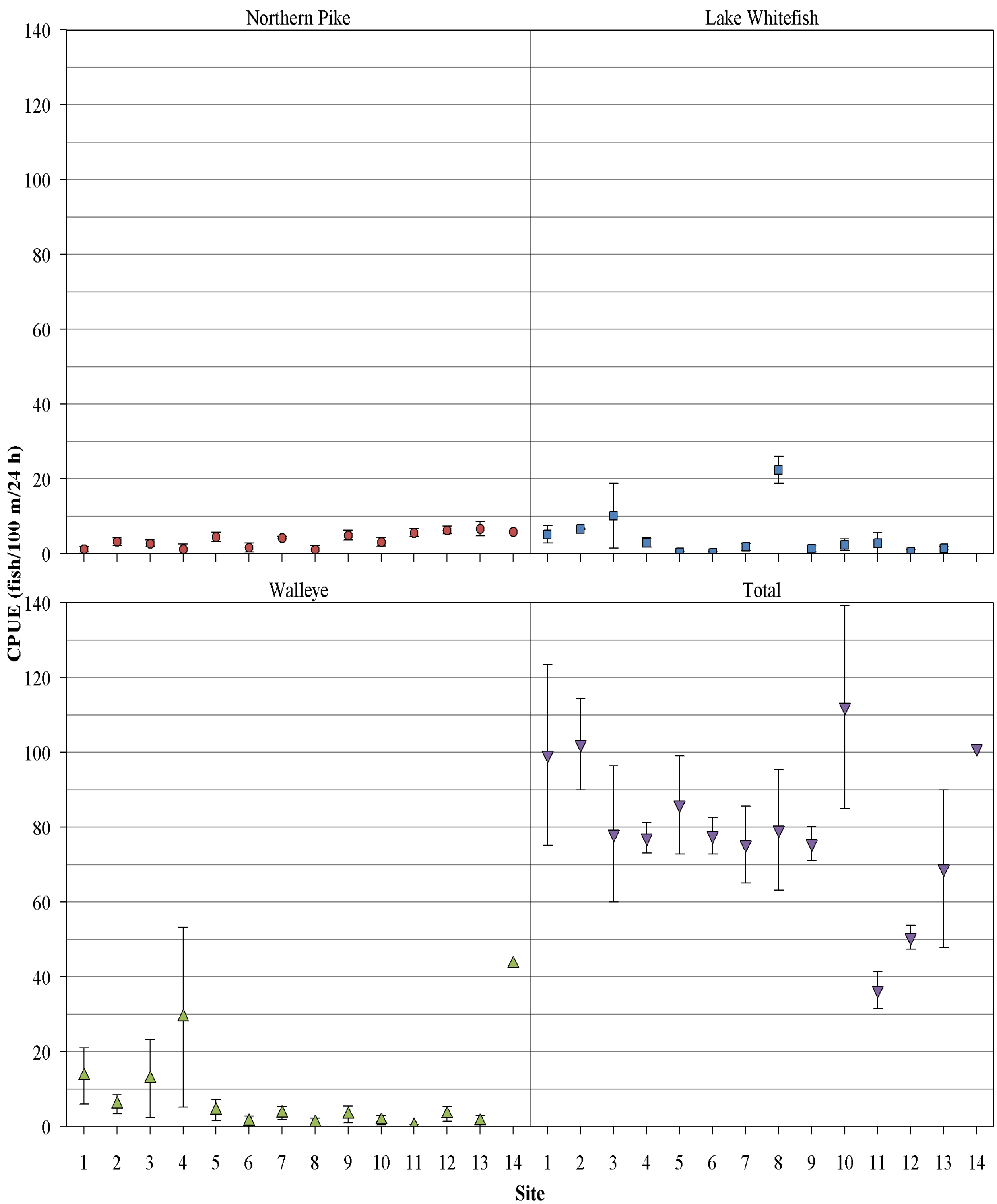


Figure 5.3.7-15. Mean CPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Granville Lake, 2008-2010.

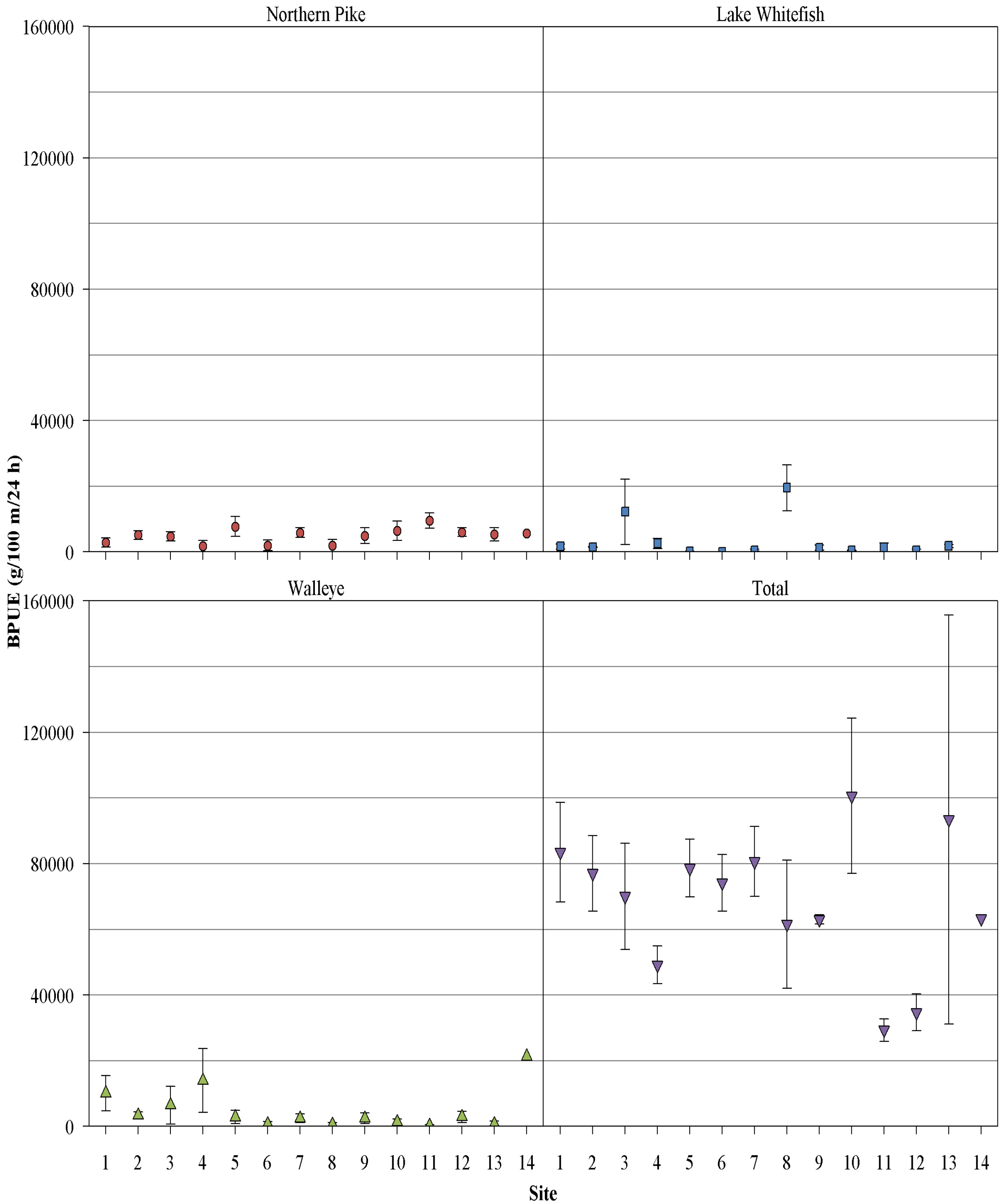


Figure 5.3.7-16. Mean BPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Granville Lake, 2008-2010.

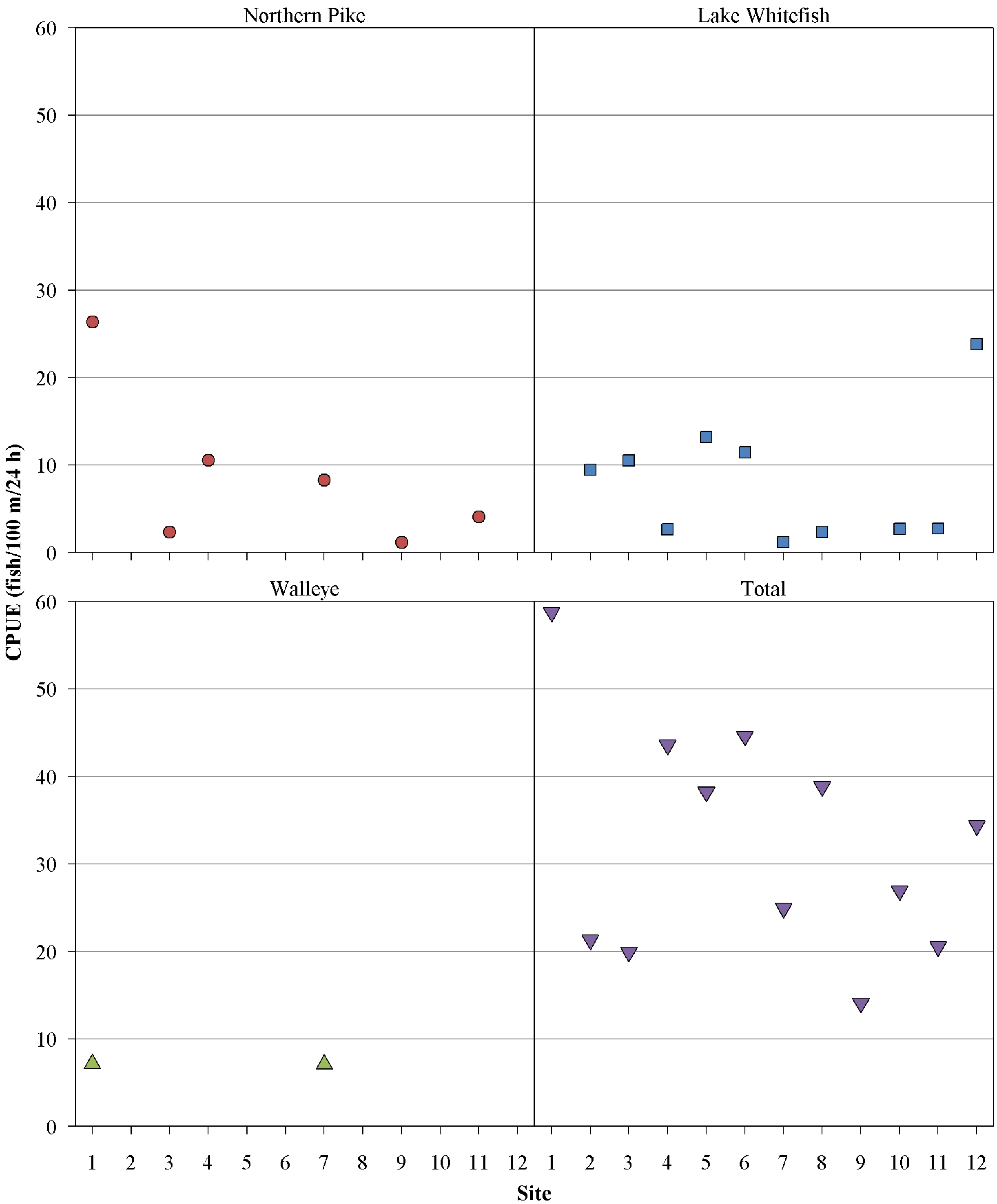


Figure 5.3.7-17. Mean CPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Southern Indian Lake – Area 1 in 2009.

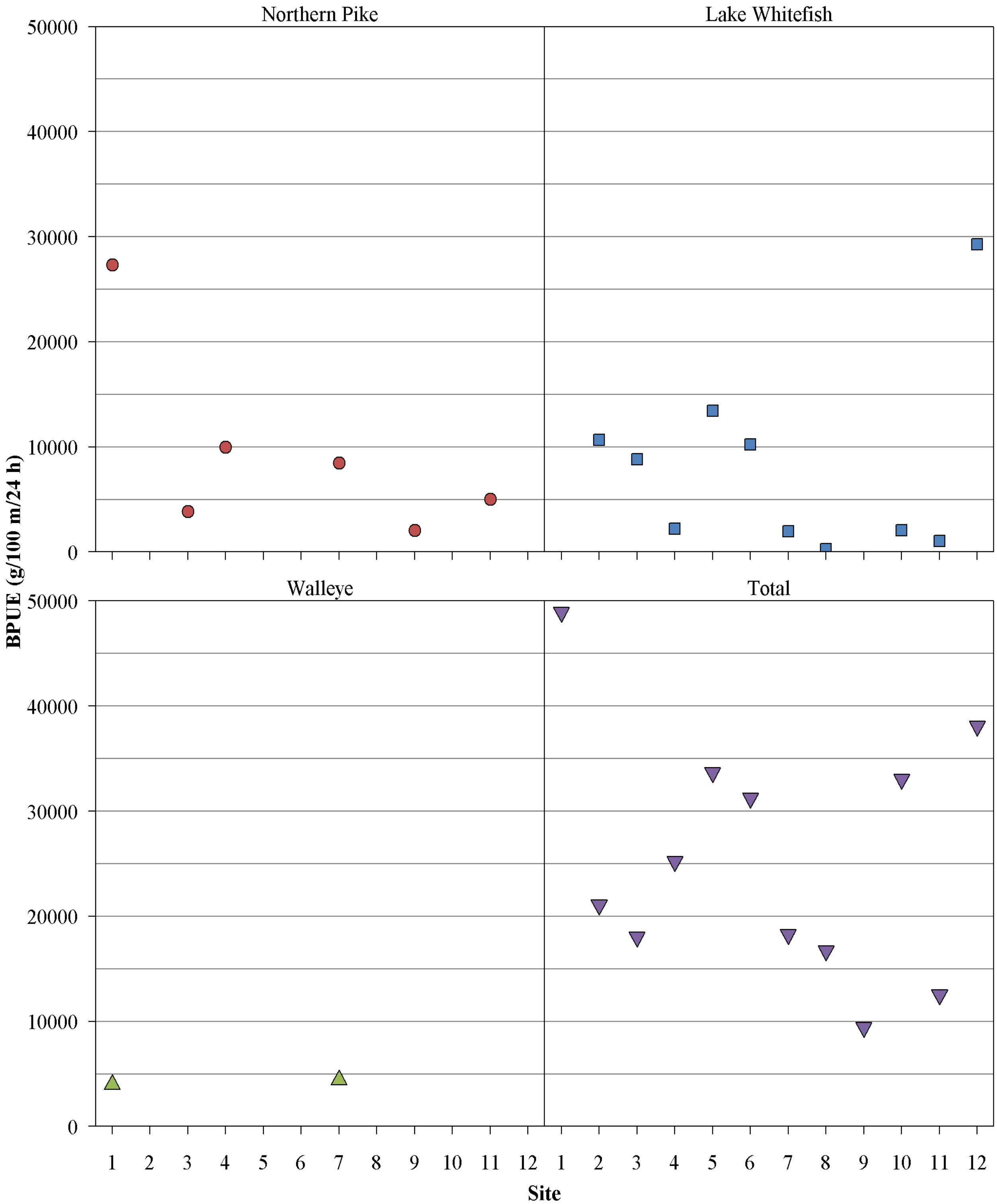


Figure 5.3.7-18. Mean BPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Southern Indian Lake – Area 1 in 2009.

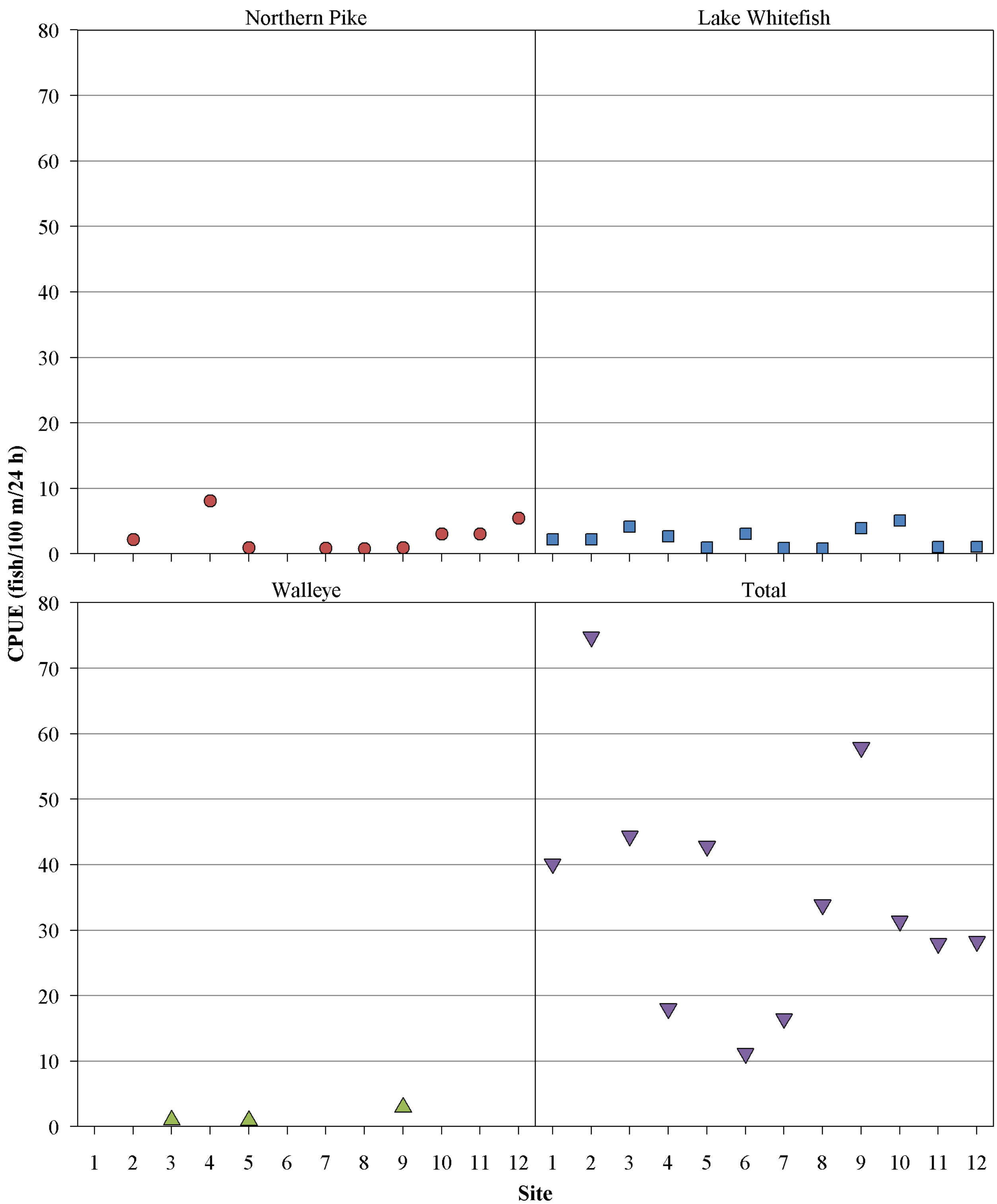


Figure 5.3.7-19. Mean CPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Southern Indian Lake – Area 6 in 2010.

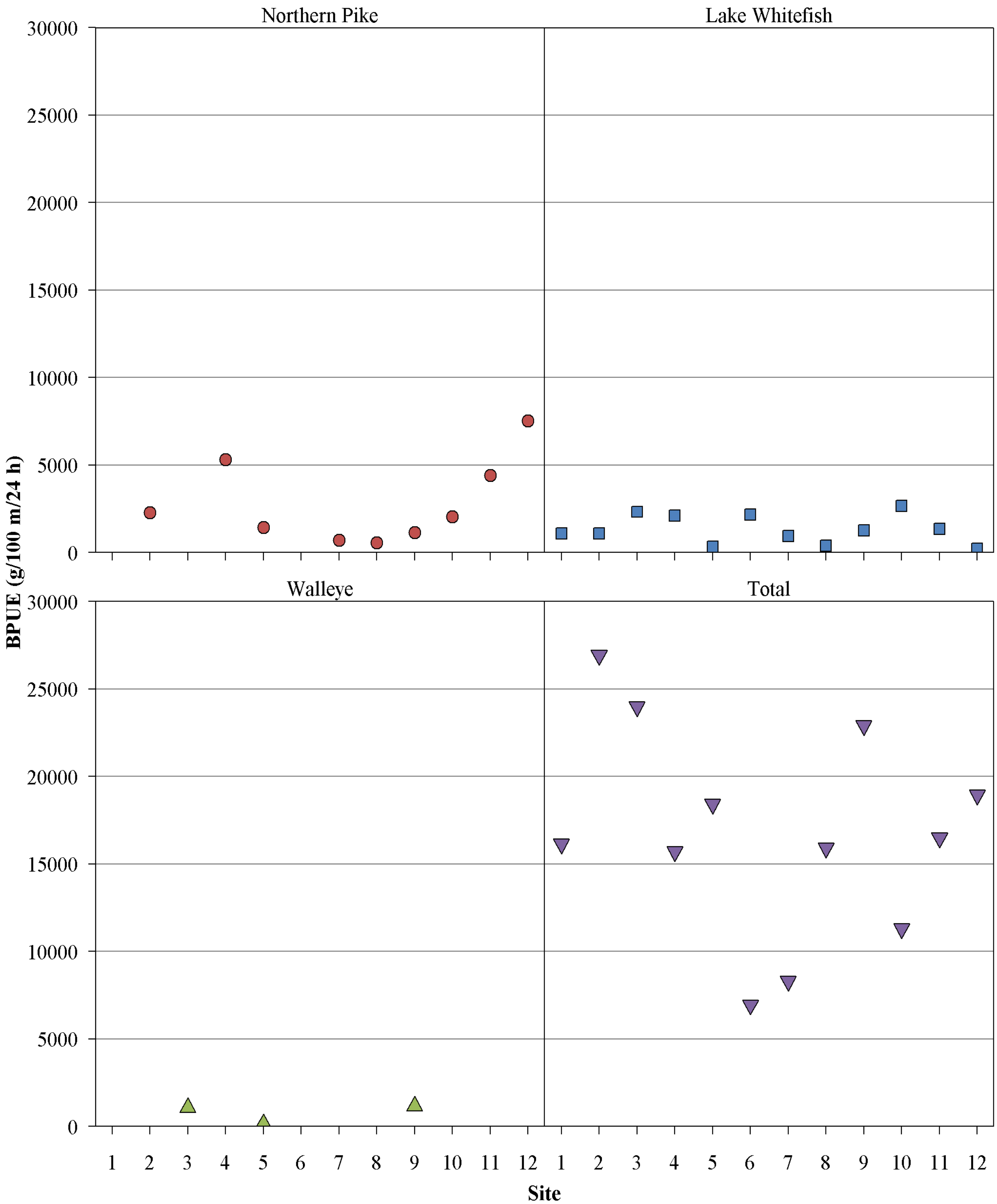


Figure 5.3.7-20. Mean BPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Southern Indian Lake – Area 6 in 2010.

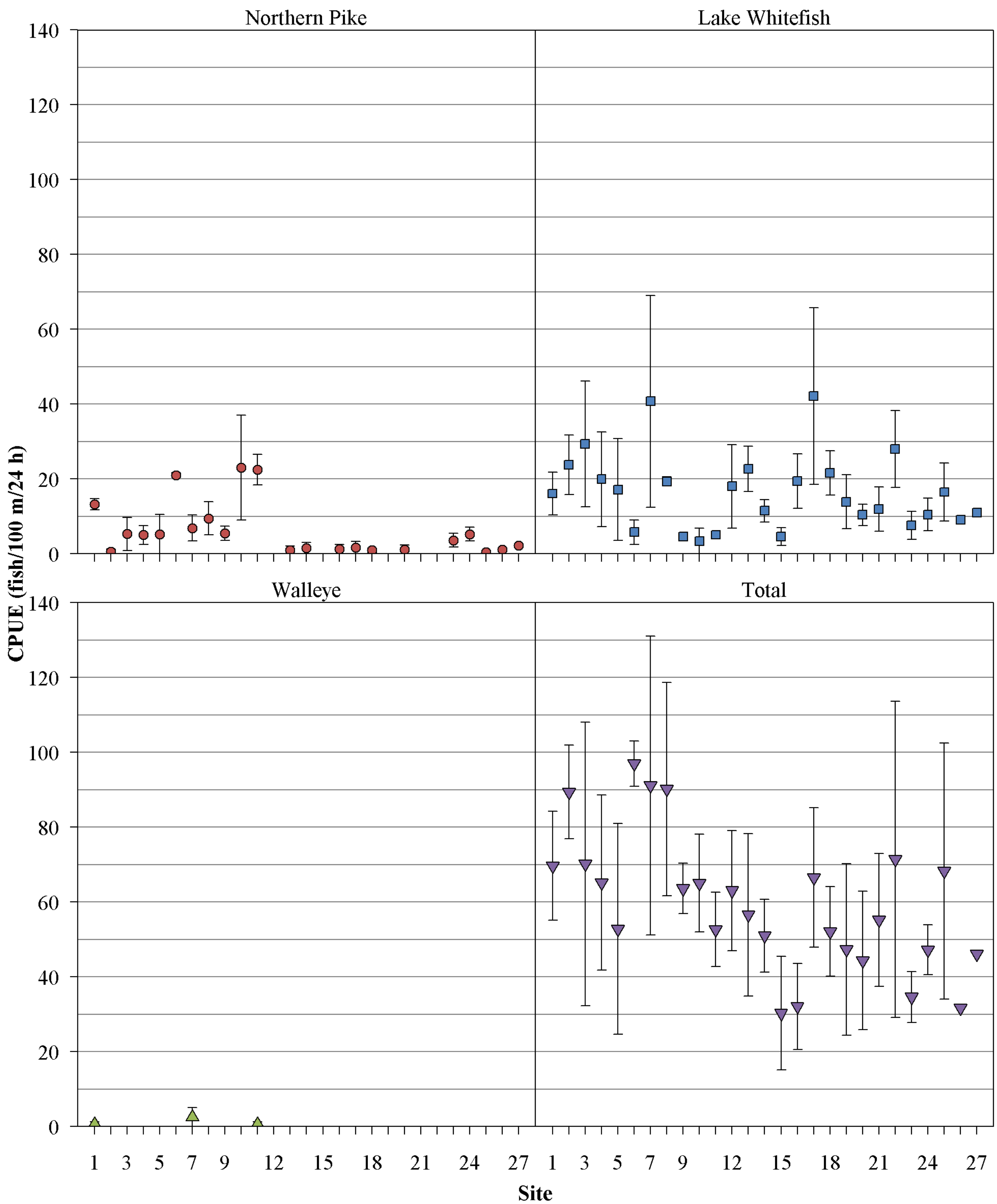


Figure 5.3.7-21. Mean CPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Southern Indian Lake – Area 4 from 2008-2010.

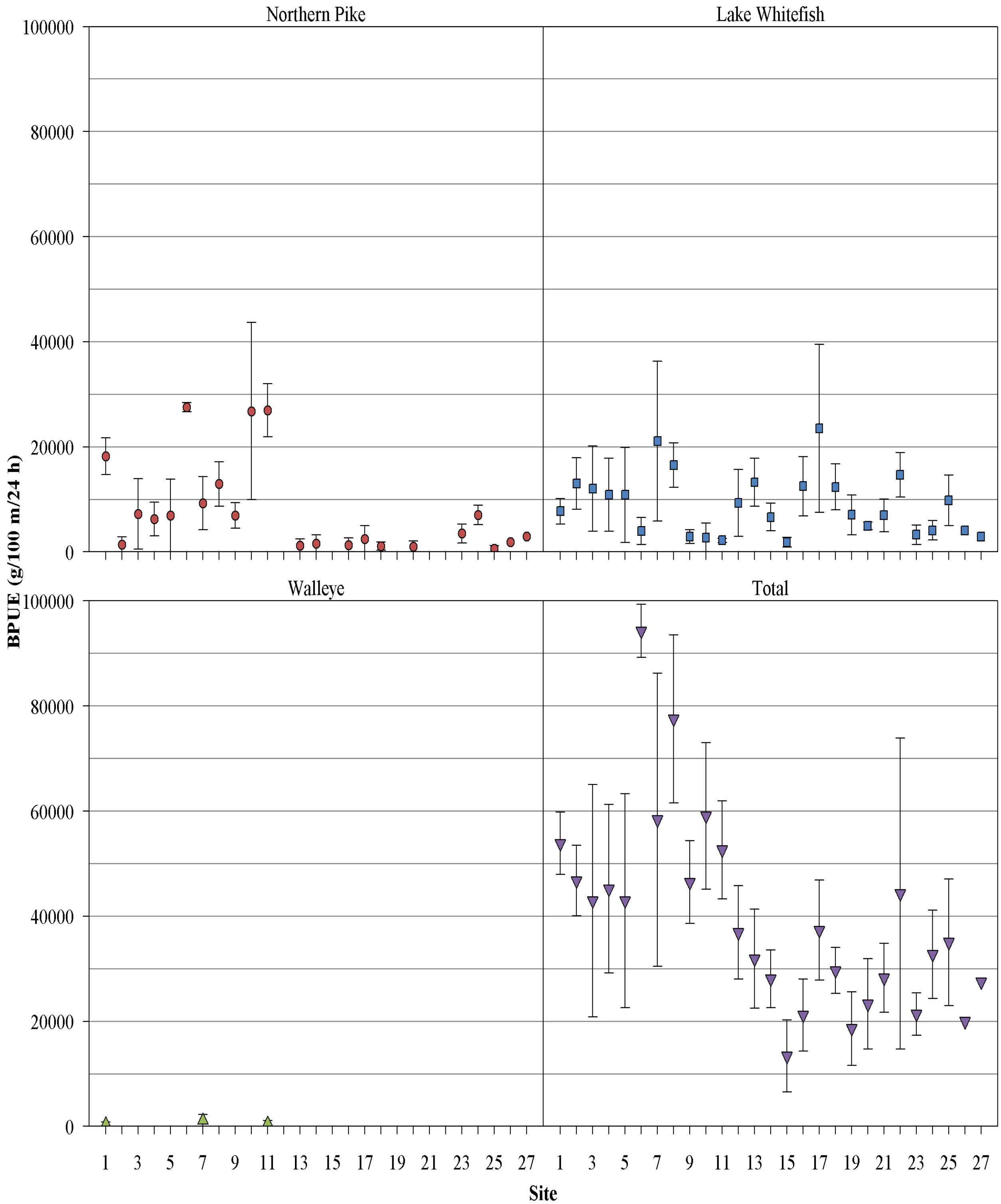


Figure 5.3.7-22. Mean BPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Southern Indian Lake – Area 4 from 2008-2010.

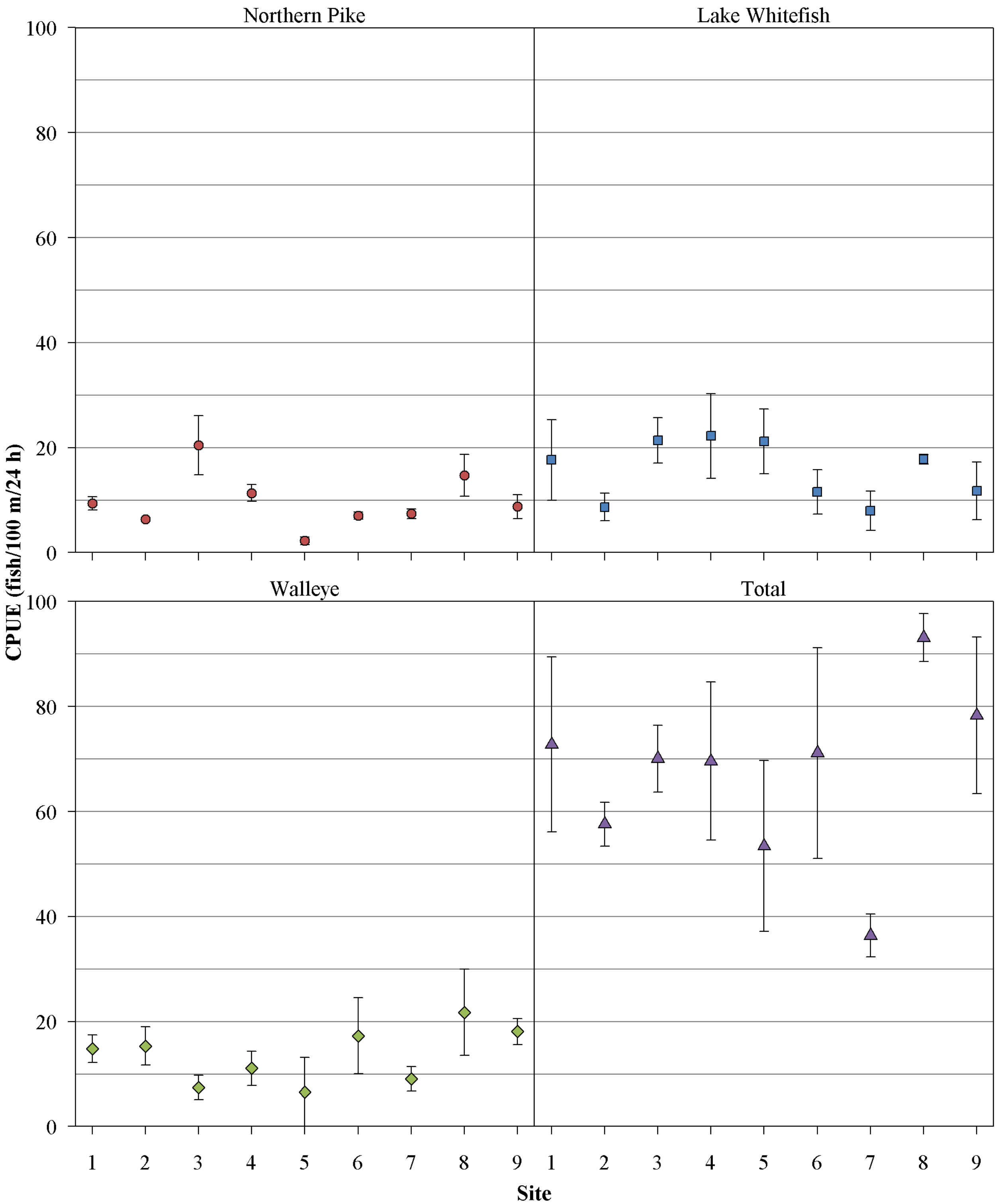


Figure 5.3.7-23. Mean CPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Gauer Lake from 2008-2010.

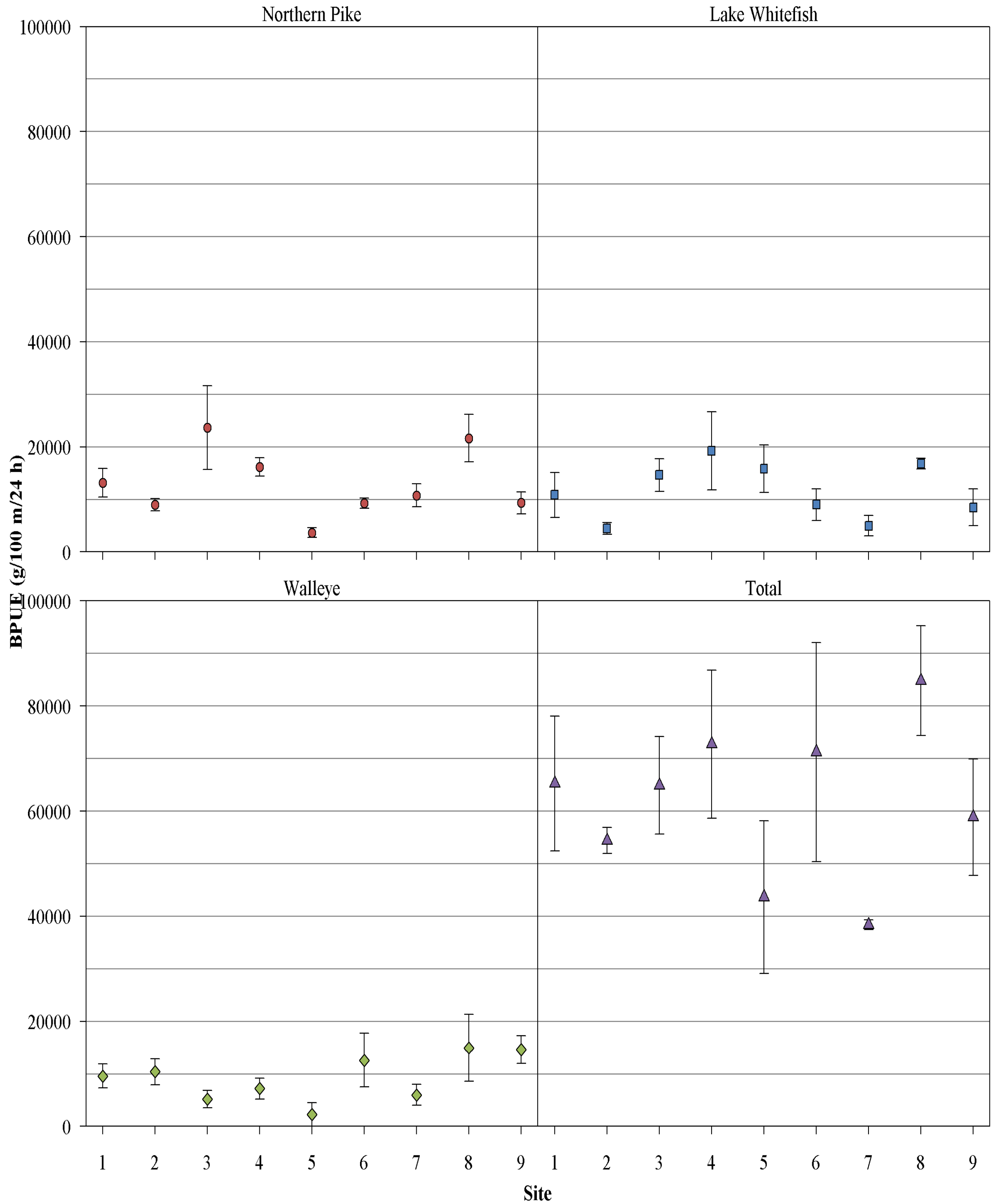


Figure 5.3.7-24. Mean BPUE (SE) by site for Northern Pike, Lake Whitefish, Walleye, and all species combined (Total) captured in standard gang index gill nets set in Gauer Lake from 2008-2010.

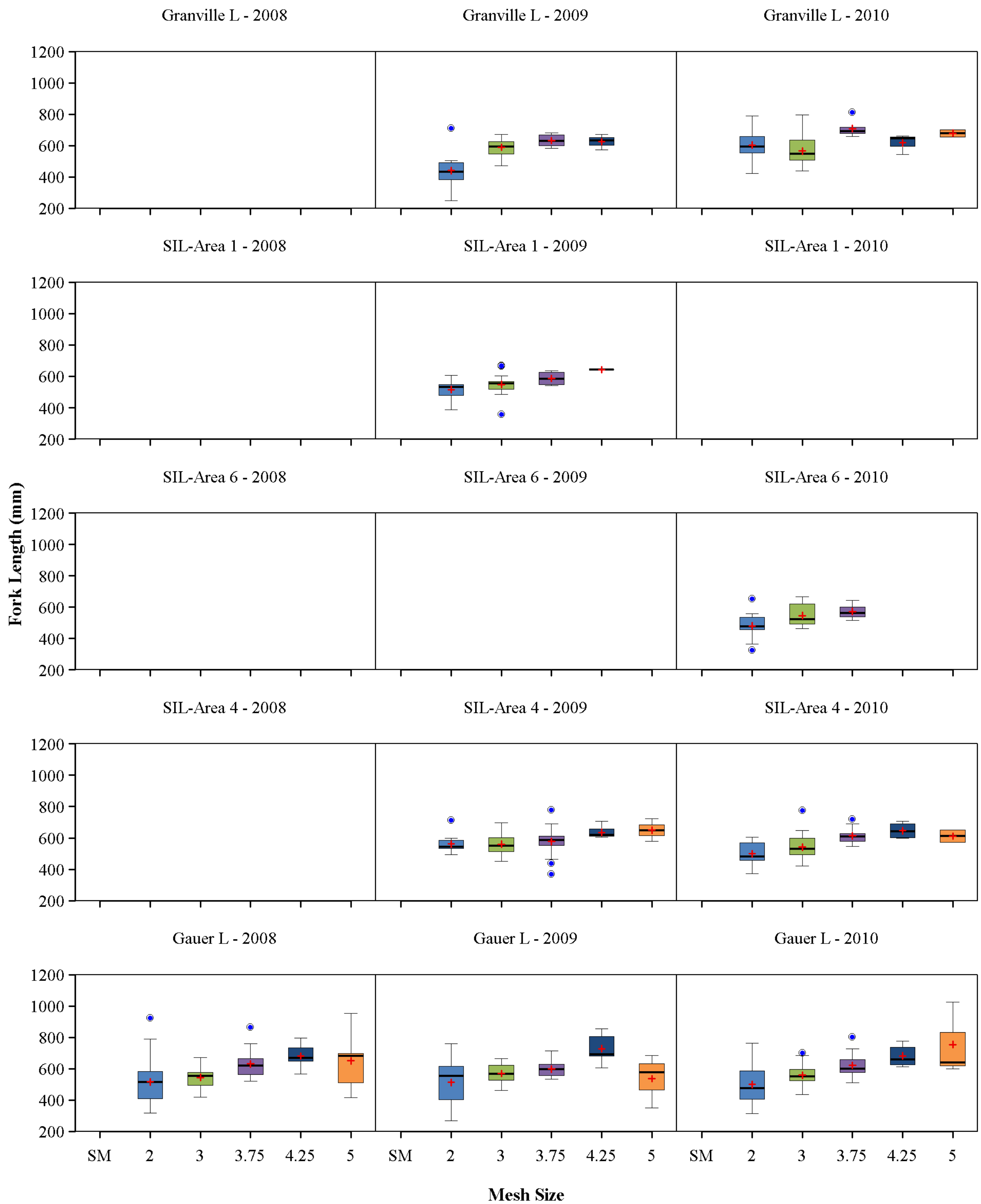


Figure 5.3.7-25. Mean and median (range) fork length (mm) per mesh size calculated for Northern Pike captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

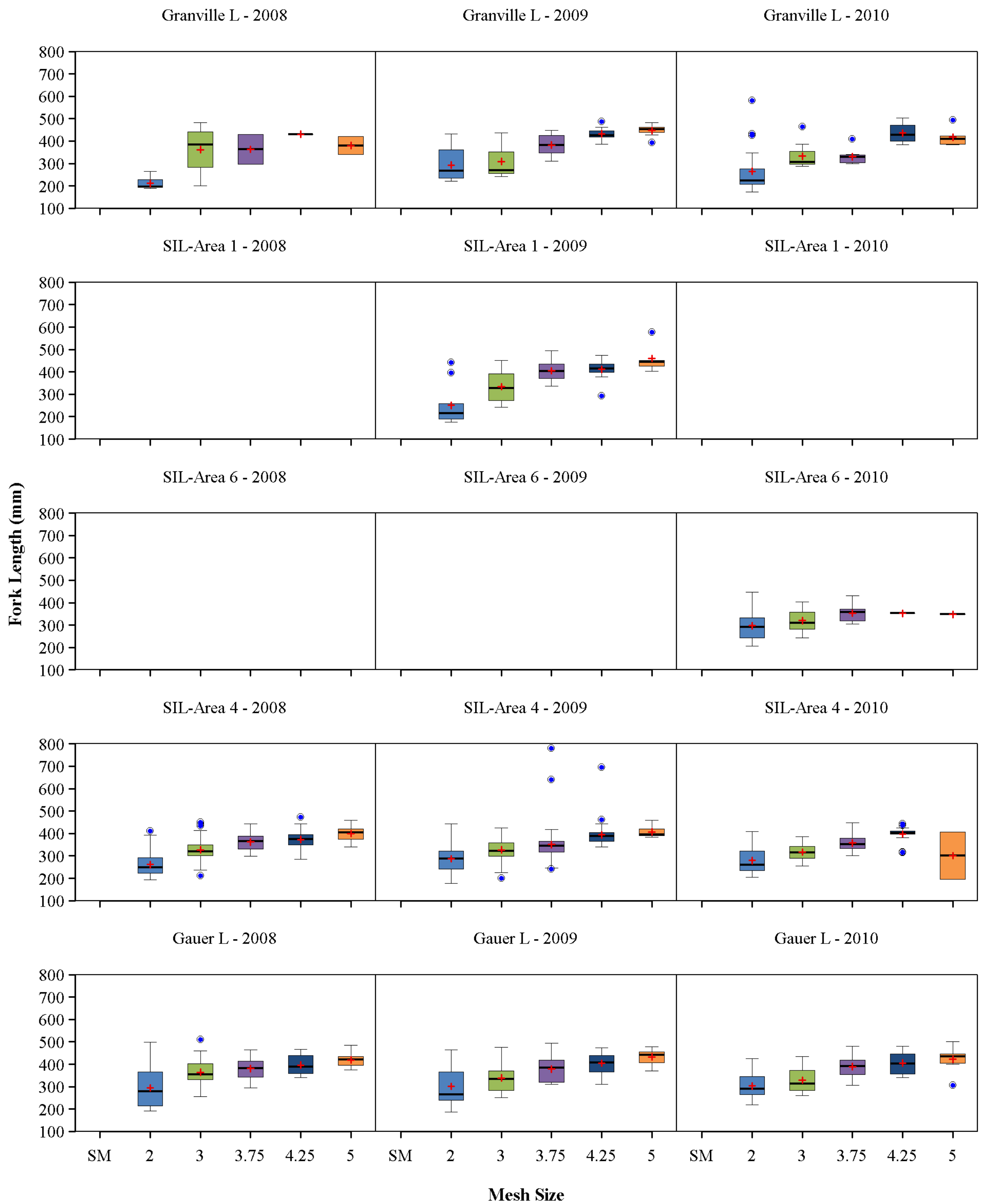


Figure 5.3.7-26. Mean and median (range) fork length (mm) per mesh size calculated for Lake Whitefish captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

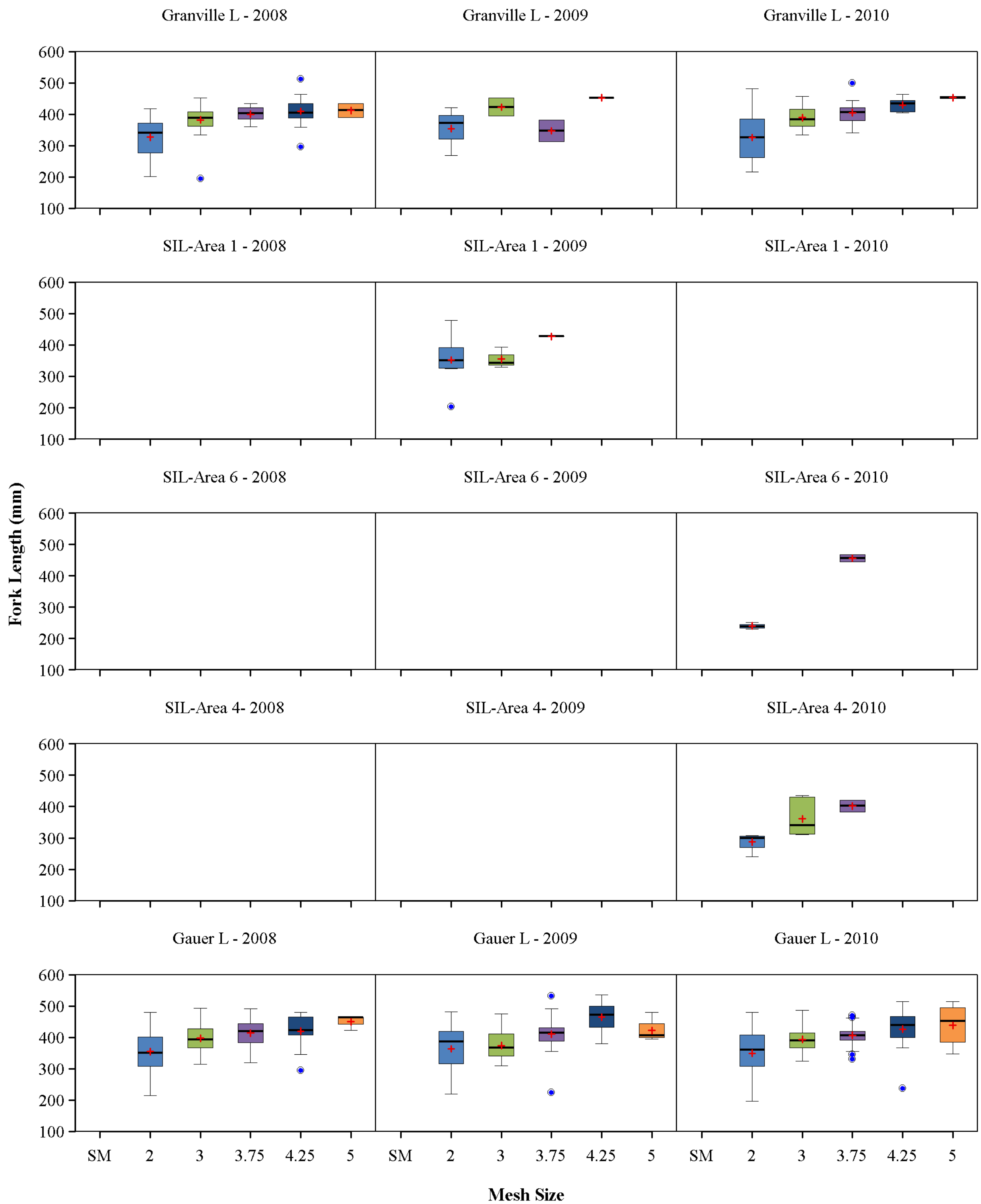


Figure 5.3.7-27. Mean and median (range) fork length (mm) per mesh size calculated for Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008-2010.

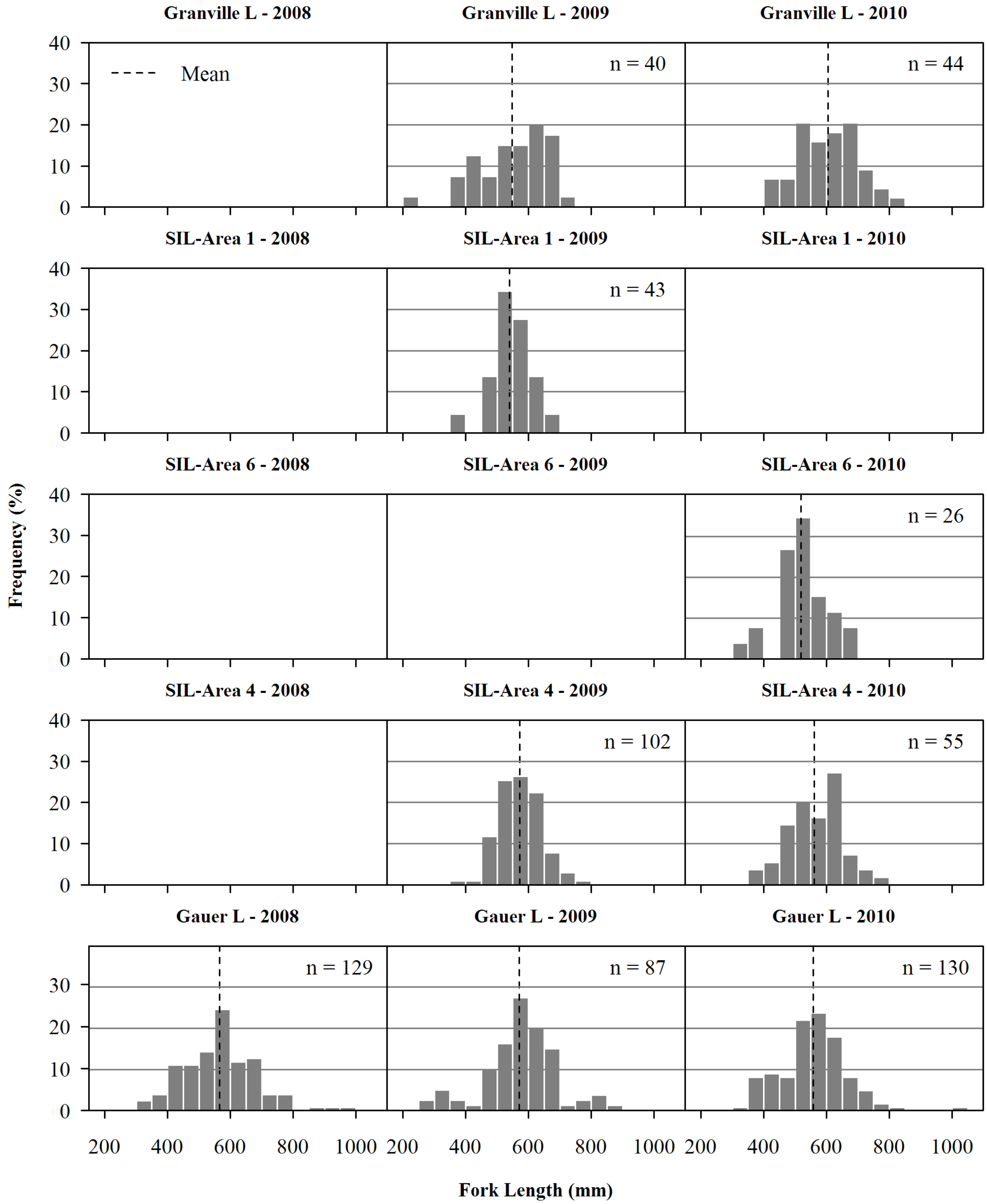


Figure 5.3.7-28. Fork length frequencies for Northern Pike captured in Upper Churchill River Region waterbodies, 2008-2010. Dashed vertical line represents mean fork length

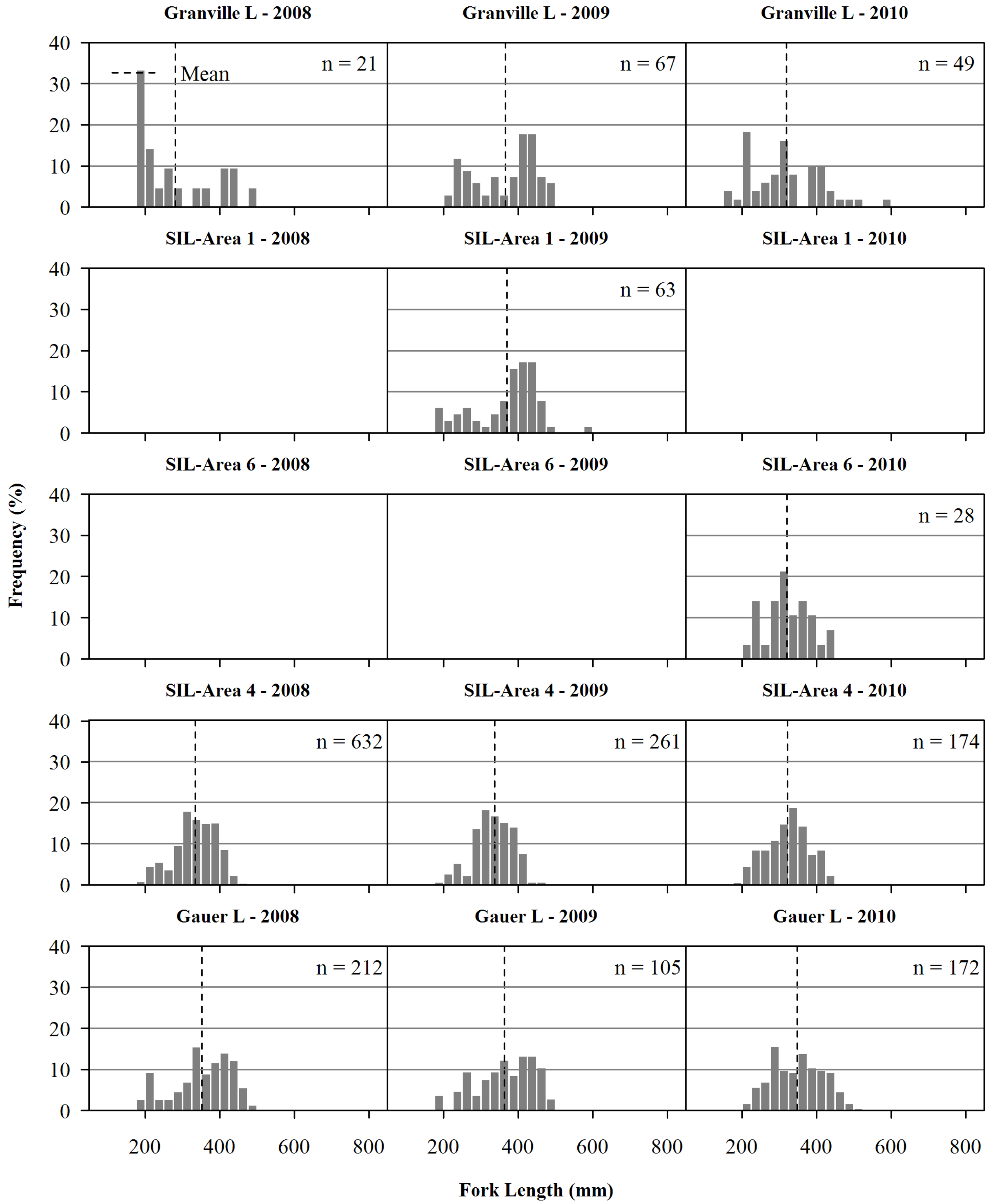


Figure 5.3.7-29. Fork length frequencies for Lake Whitefish captured in Upper Churchill River Region waterbodies, 2008-2010. Dashed vertical line represents mean fork length.

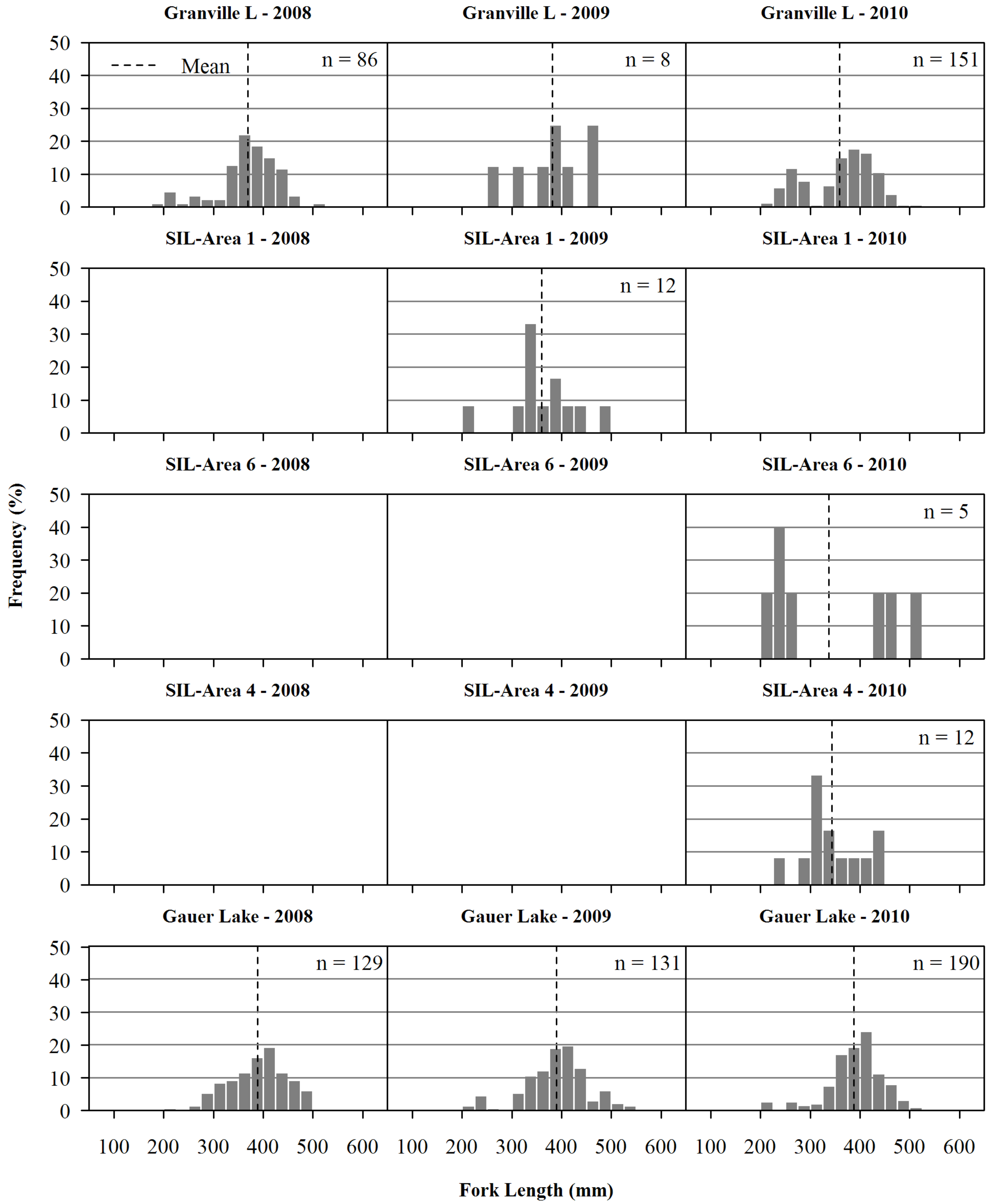


Figure 5.3.7-30. Fork length frequencies for Walleye captured in Upper Churchill River Region waterbodies, 2008-2010. Dashed vertical line represents mean fork length.

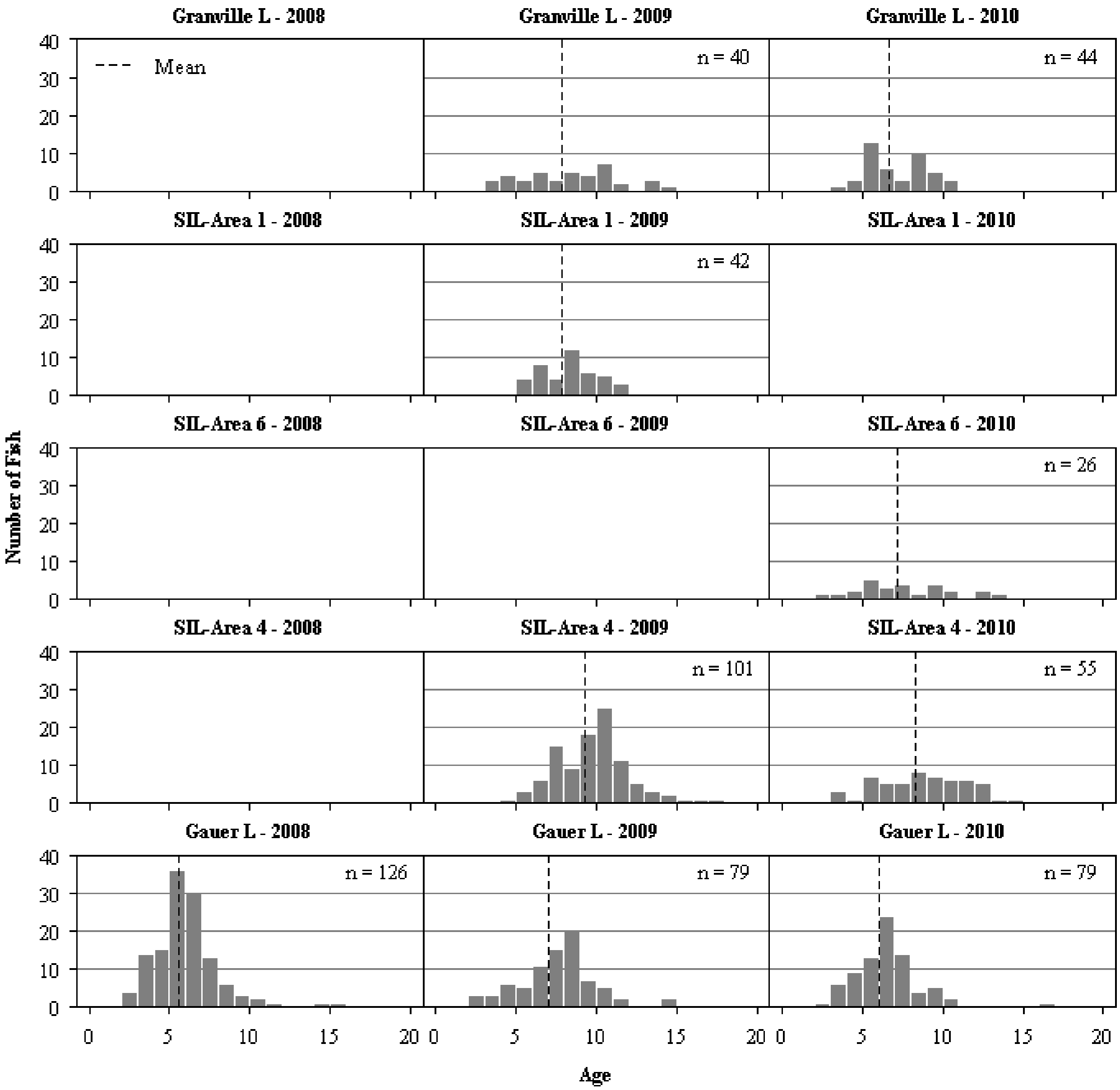


Figure 5.3.7-31. Catch-at-age plots for Northern Pike captured in Upper Churchill River Region waterbodies, 2008-2010. Dashed vertical line represents mean age.

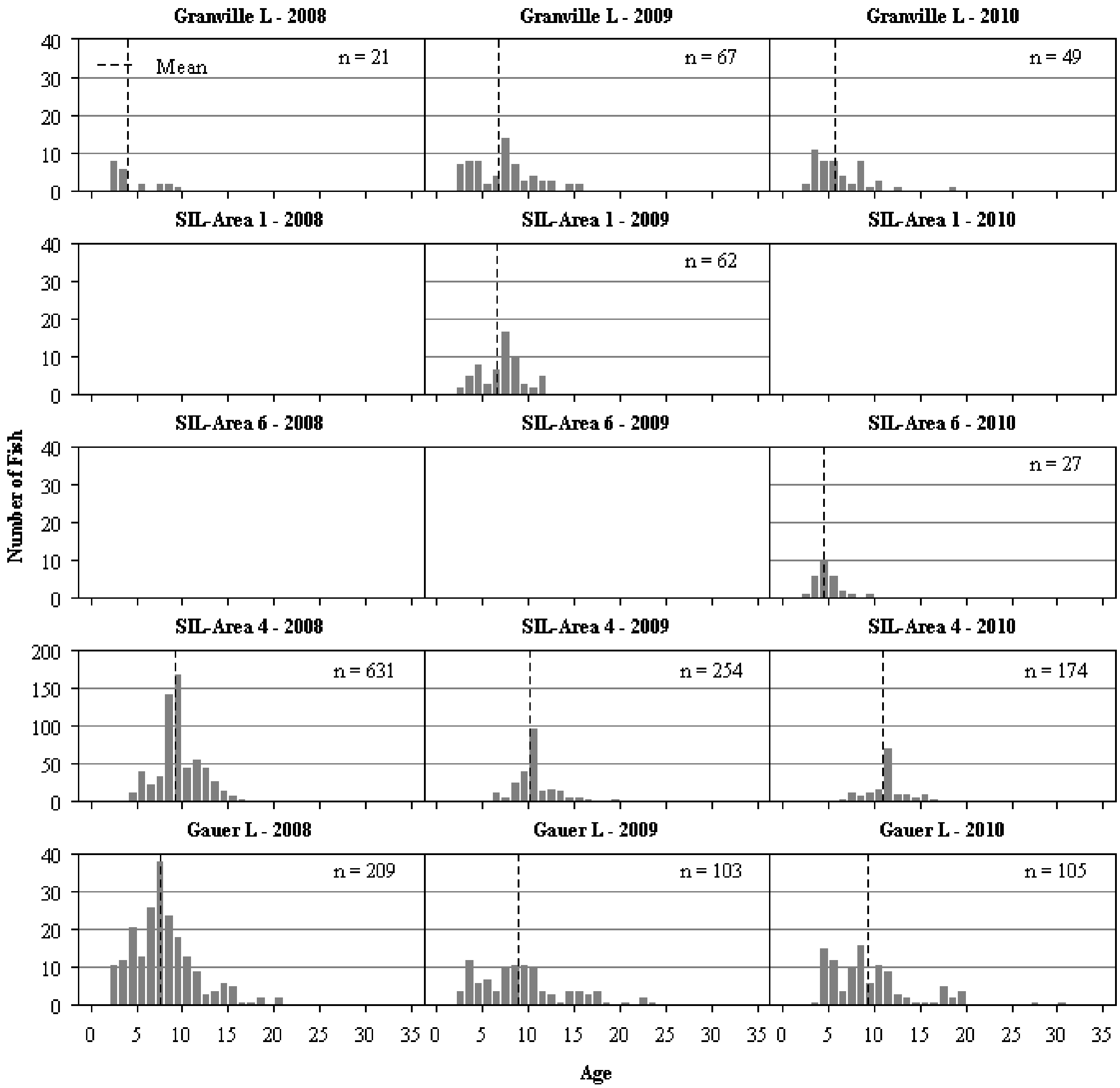


Figure 5.3.7-32. Catch-at-age plots for Lake Whitefish captured in Upper Churchill River Region waterbodies, 2008-2010. Dashed vertical line represents mean age.

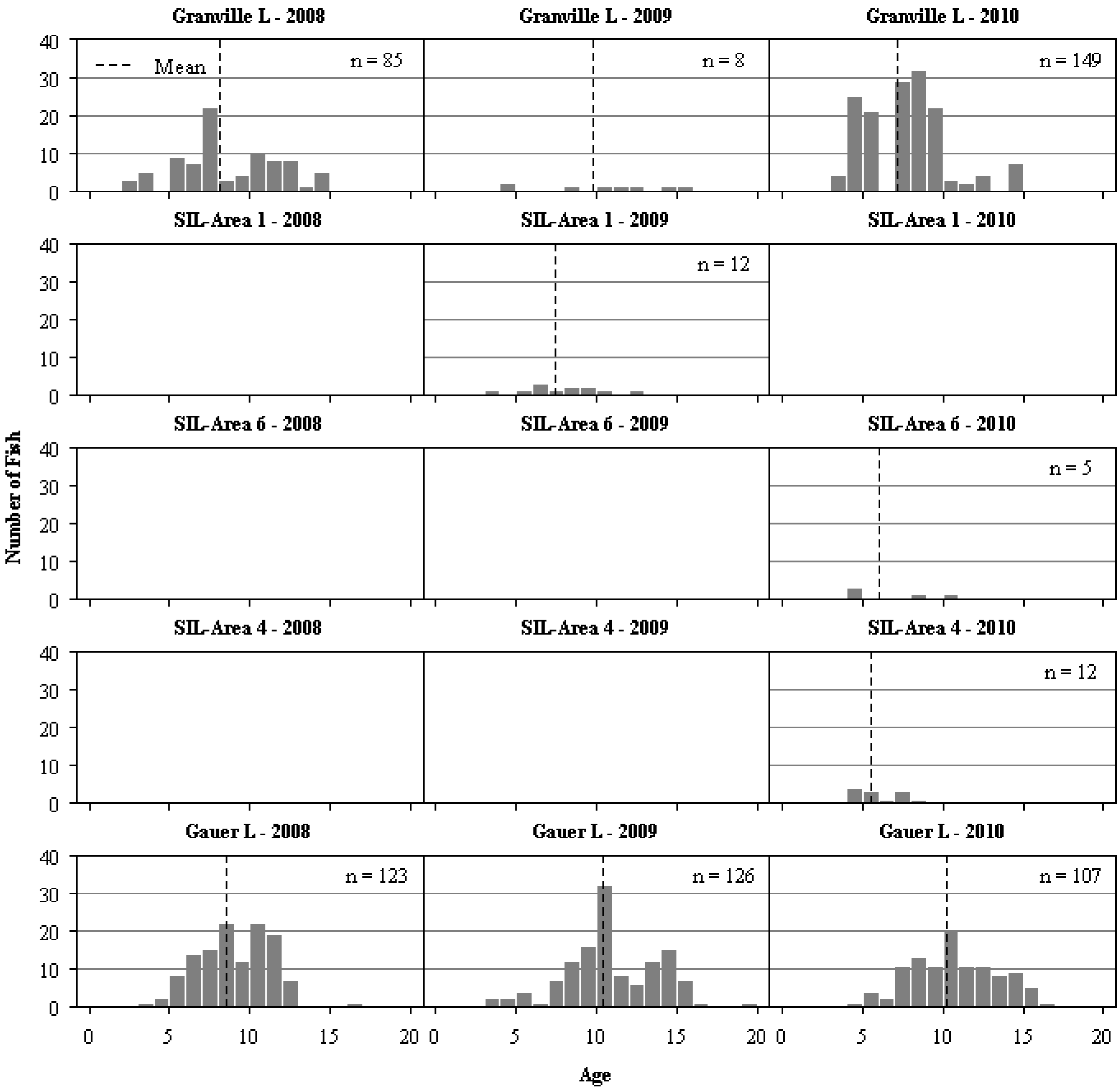


Figure 5.3.7-33. Catch-at-age plots for Walleye captured in Upper Churchill River Region waterbodies, 2008-2010. Dashed vertical line represents mean age.

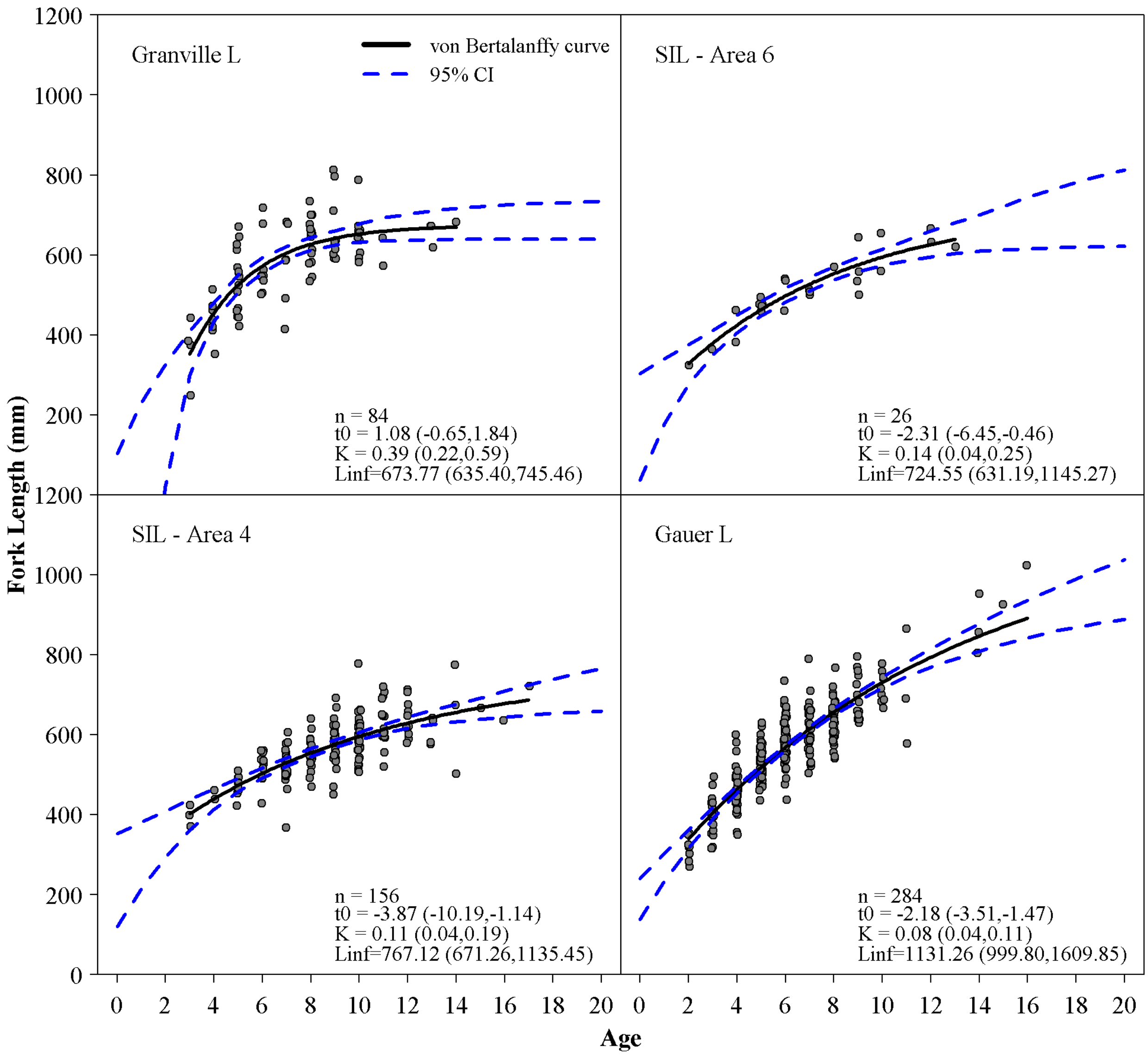


Figure 5.3.7-34. Fitted typical von Bertalanffy growth model for Northern Pike captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008 - 2010. Estimated von Bertalanffy growth model parameters (asymptotic length Linf, growth coefficient K, and age when the average length was zero t0) are shown.

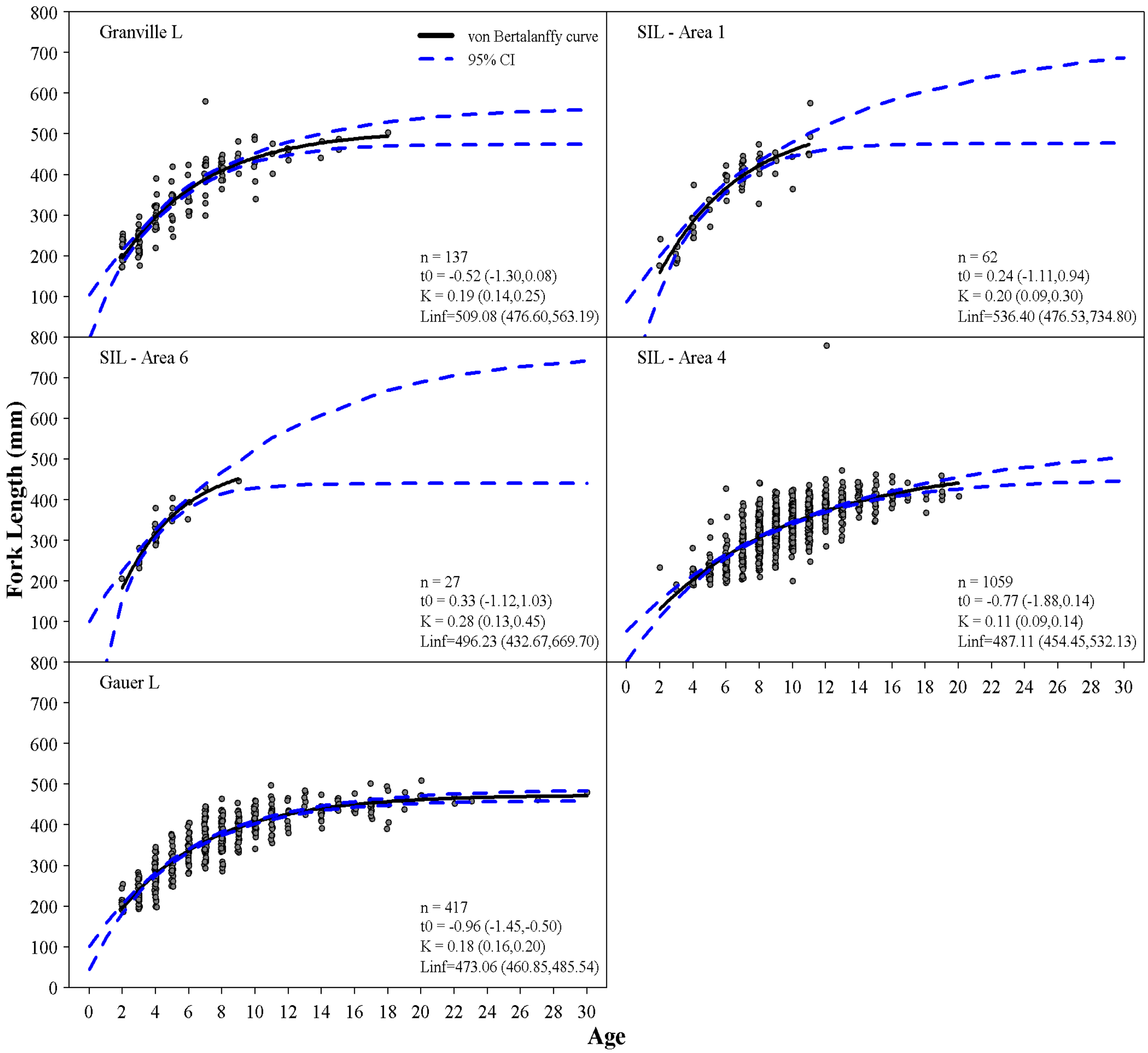


Figure 5.3.7-35. Fitted typical von Bertalanffy growth model for Lake Whitefish captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008 - 2010. Estimated von Bertalanffy growth model parameters (asymptotic length Linf, growth coefficient K, and age when the average length was zero t0) are shown.

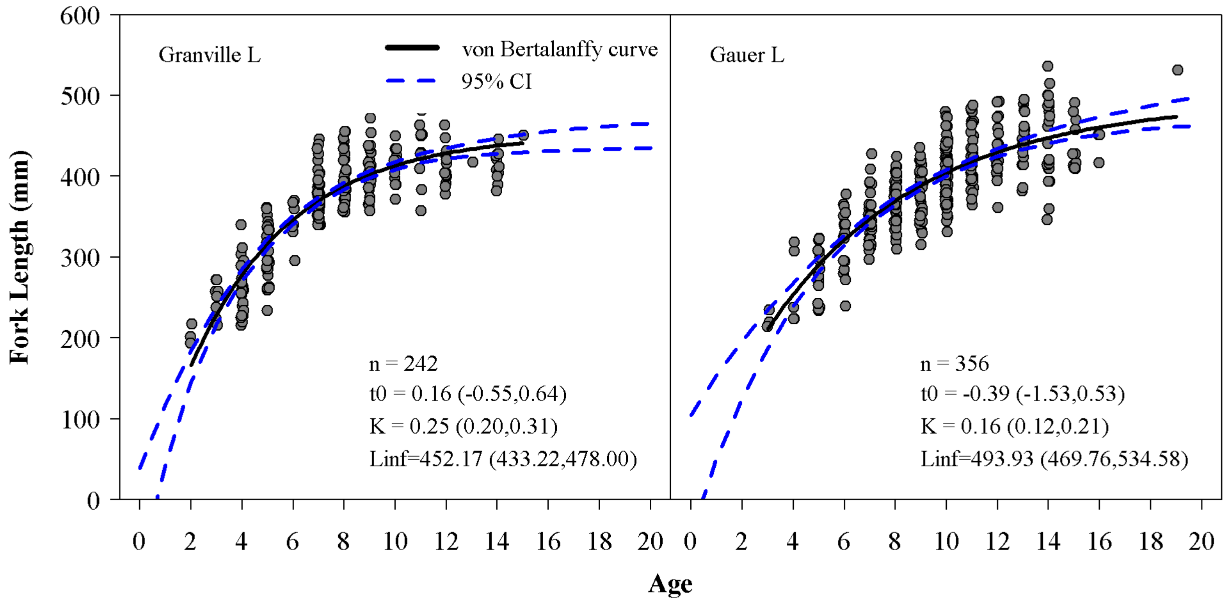


Figure 5.3.7-36. Fitted typical von Bertalanffy growth model for Walleye captured in standard gang index gill nets set in Upper Churchill River Region waterbodies, 2008 - 2010. Estimated von Bertalanffy growth model parameters (asymptotic length Linf, growth coefficient K, and age when the average length was zero t0) are shown.

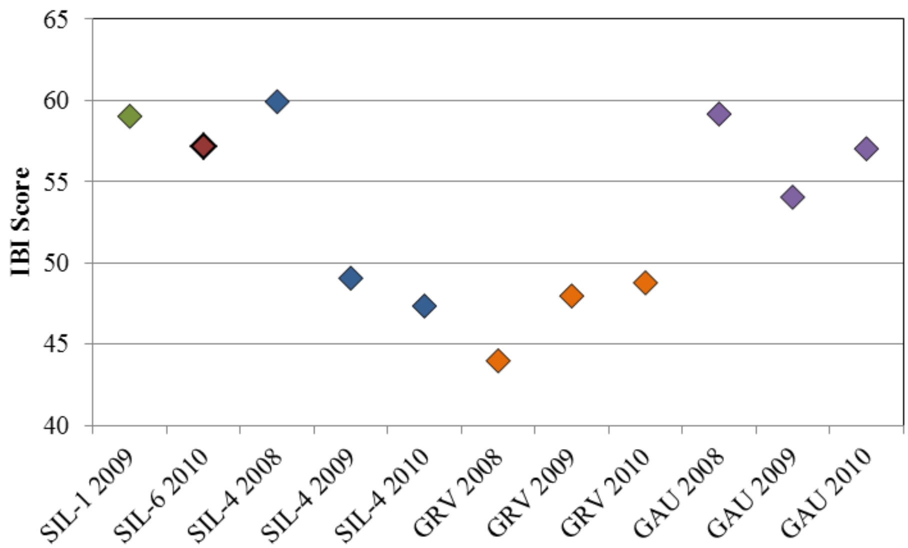


Figure 5.3.7-37. Scatter plot of yearly IBI scores for Upper Churchill River Region waterbodies, 2008-2010.

5.3.8 Fish Mercury

The following provides an overview of the results of fish mercury monitoring conducted in the Upper Churchill River Region under CAMPP; sampling was conducted exclusively in 2010. Waterbodies sampled included Area 4 (Figure 5.3.8-1) and Area 6 (Figure 5.3.8-2) of Southern Indian Lake (SIL), and the off-system Granville Lake (Figure 5.3.8-3). Comparisons are also made to the off-system and Gauer Lake (Figure 5.3.8-4). Details of sampling locations, times, and methodology are provided in Appendix 1.

5.3.8.1 Species comparisons

A total of 365 fish were analyzed for mercury in the Upper Churchill River Region in 2010. Aside from Walleye in SIL-Area 4 (n=12) and SIL-Area 6 (n=7), sample sizes for the three large-bodied species were close or equal to the target of 36 fish (Table 5.3.8-1). No 1-year old Yellow Perch were caught from any of the four locations.

Except for Walleye from SIL-Area 4, mercury concentration and fish length were significantly positively correlated for the three species captured from all four locations (Figures 5.3.8-5 and 5.3.8-6) indicating that length-standardization of concentrations is necessary for comparative purposes. Length-standardized concentrations were within 15% of arithmetic concentrations (Table 5.3.8-1), reflecting the fact that the mean lengths of fish analyzed for mercury were within 86% and 107% of the standard length of each species (Table 5.3.8-2).

Mean arithmetic mercury concentrations of Northern Pike and Walleye from SIL-Area 6, Granville Lake, and Gauer Lake were similar, whereas concentrations in Northern Pike were significantly higher compared to Walleye in SIL-Area 4 (Table 5.3.8-1).

For all four locations, mean arithmetic mercury concentrations of the two predatory species were significantly higher than those of Lake Whitefish. However, whereas the difference between means in Northern Pike and Walleye from SIL-Area 6, Granville and Gauer lakes ranged from 5.5 to almost 20 times, mercury concentrations in Walleye from SIL-Area 4 were only three times higher than in Lake Whitefish (Table 5.3.8-1). This represents one of the smallest differences in mercury concentrations observed between adults of Walleye and Lake Whitefish for Manitoba waters (Jansen 2010a,b; Bodaly et al. 2007; Jansen 2009; Jansen and Strange 2009, 2007a,b; Bodaly et al. 1987; Green 1986). This suggests that the small number of Walleye analysed from SIL-Area 4 for mercury may not adequately represent the average mercury concentration in the Walleye population and may also have contributed to the lack of a significant difference between fish length and mercury concentration for this species (Figure 5.3.8-5).

5.3.8.2 Comparison to consumption guidelines

With a range of 0.44 to 0.52 parts per million (ppm; Table 5.3.8-1), length-standardized mercury concentrations of Northern Pike and Walleye from Granville Lake and SIL-Area 6 were slightly below or marginally above the Health Canada 0.5 ppm standard for commercial marketing of freshwater fish in Canada (Health Canada 2007a,b) and the Manitoba aquatic life tissue residue guideline for human consumers (Manitoba Water Stewardship [MWS] 2011). In contrast, the arithmetic mean mercury concentration for Walleye from SIL-Area 4 and the length-standardized means for Northern Pike and Walleye from Gauer Lake, marginally exceeded 0.2 ppm (Table 5.3.8-1), a level commonly accepted as a safe consumption limit for people eating large quantities of fish domestically (see section 4.8.2.3). Length-standardized mercury concentrations in Lake Whitefish from all four locations were several times lower than the 0.2 ppm guideline.

Based on individual concentrations, approximately 80% of all Northern Pike and Walleye, but none of the Lake Whitefish, from the Upper Churchill River Region contained mercury in excess of the 0.2 ppm guideline (Figures 5.3.8-5 and 5.3.8-6). Approximately 30% of Northern Pike and 12% of Walleye had mercury concentrations that were also higher than the 0.5 ppm Health Canada standard and the Manitoba human consumption guideline (Figures 5.3.8-5 and 5.3.8-6).

Total mercury concentrations measured in the majority of Northern Pike, Lake Whitefish, and Walleye were substantially higher than the Canadian Council of Ministers of the Environment (CCME) and Manitoba tissue residue guidelines of 0.033 ppm methylmercury for the protection of wildlife consumers of aquatic biota (CCME 1999; updated to 2013; MWS 2011); exceptions were 46 Lake Whitefish mainly from SIL-Area 6 and Gauer Lake. While CAMPP monitors for total mercury rather than methylmercury in fish muscle, the vast majority of mercury in fish muscle is in the form of methylmercury (see section 4.8.2.3) and comparison to these guidelines is conservative.

5.3.8.3 Spatial comparisons

Length-standardized mercury concentrations in Northern Pike, Walleye, and Lake Whitefish differed significantly between locations. Northern Pike and Walleye from Granville Lake and SIL-Area 6 contained the highest concentrations in the region. Length-standardized or mean arithmetic (for walleye) mercury concentrations were significantly higher in all species collected from Area 6 than Area 4 of SIL (Figure 5.3.8-7). Conversely, Lake Whitefish from SIL-Area 4 had significantly higher length-standardized mercury concentrations than in the same species from all other locations. In addition, one or more species from Gauer Lake contained significantly lower mercury concentrations than their conspecifics from the three other waterbodies (Figure 5.3.8-7).

Table 5.3.8-1. Arithmetic mean (± standard error, SE) and length-standardized (± 95% confidence limit, CL) mercury concentrations (ppm) in Lake Whitefish, Northern Pike, Walleye, and Yellow Perch captured in the Upper Churchill River Region in 2010; SIL = Southern Indian Lake.

Waterbody	Species	n	Arithmetic	SE	Standard	95% CL
Granville L	Northern Pike	37	0.513[b]	0.038	0.441	0.392 - 0.497
	Walleye	35	0.416[b]	0.026	0.441	0.401 - 0.485
	Lake Whitefish	36	0.047[a]	0.003	0.052	0.048 - 0.056
SIL-Area 6	Northern Pike	28	0.499[b]	0.053	0.520	0.443 - 0.610
	Walleye	7	0.421[b]	0.137	0.457	0.271 - 0.771
	Lake Whitefish	29	0.026[a]	0.002	0.028	0.025 - 0.030
SIL-Area 4	Northern Pike	36	0.408[c]	0.026	0.371	0.330 - 0.417
	Walleye	12	0.217[b]	0.011	-*	0.194 - 0.240
	Lake Whitefish	37	0.070[a]	0.003	0.072	0.066 - 0.079
Gauer L	Northern Pike	36	0.238[b]	0.022	0.202	0.182 - 0.224
	Walleye	33	0.249[b]	0.017	0.246	0.222 - 0.272
	Lake Whitefish	36	0.041[a]	0.003	0.036	0.032 - 0.040

* The relationship between mercury concentration and fish length was not significant; the CL is for the arithmetic mean.

Note: Different superscripts indicate significant differences between species within a waterbody. For significant differences between standardized means (i.e., within species between waterbodies) see Figure 5.3.8-7.

Table 5.3.8.-2. Mean (± standard error, SE) fork length, round weight, condition (K), and age of fish species sampled for mercury from the Upper Churchill River Region in 2010.

Waterbody	Species	n	Length (mm)	Weight (g)	K	Age (years)
Granville L	Northern Pike [a]	37	588.9 ± 16.6	1577.3 ± 169.1	0.69 ± 0.01	7.0 ± 0.4
	Walleye [b]	35	376.4 ± 11.0	623.7 ± 49.7	1.07 ± 0.01	8.7 ± 0.5
	Lake Whitefish [c]	36	308.3 ± 15.7	563.6 ± 86.5	1.42 ± 0.03	5.7 ± 0.6
SIL-Area 6	Northern Pike	28	517.9 ± 15.8	987.1 ± 95.4	0.65 ± 0.01	7.2 ± 0.5
	Walleye	7	337.4 ± 48.7	540.0 ± 189.0	1.07 ± 0.04	5.7 ± 1.1
	Lake Whitefish [d]	29	324.1 ± 11.5	568.6 ± 58.9	1.55 ± 0.02	4.3 ± 0.3
SIL-Area 4	Northern Pike	36	562.2 ± 14.9	1352.5 ± 110.2	0.71 ± 0.01	8.1 ± 0.5
	Walleye	12	343.3 ± 17.7	549.2 ± 96.7	1.20 ± 0.03	5.5 ± 0.4
	Lake Whitefish	37	325.0 ± 10.1	480.8 ± 40.5	1.25 ± 0.02	11.1 ± 0.5
Gauer L	Northern Pike	36	572.8 ± 20.9	1492.8 ± 234.5	0.68 ± 0.01	6.2 ± 0.4
	Walleye [e]	36	390.2 ± 10.2	682.9 ± 49.4	1.08 ± 0.02	10.4 ± 0.6
	Lake Whitefish [f]	36	372.7 ± 11.8	824.9 ± 79.6	1.41 ± 0.02	10.1 ± 1.1

[a] n = 25 for age; [b] n = 34 for age; [c] n = 29 for age; [d] n = 28 for weight, K, and age; [e] n = 32 for age; [f] n = 33 for age

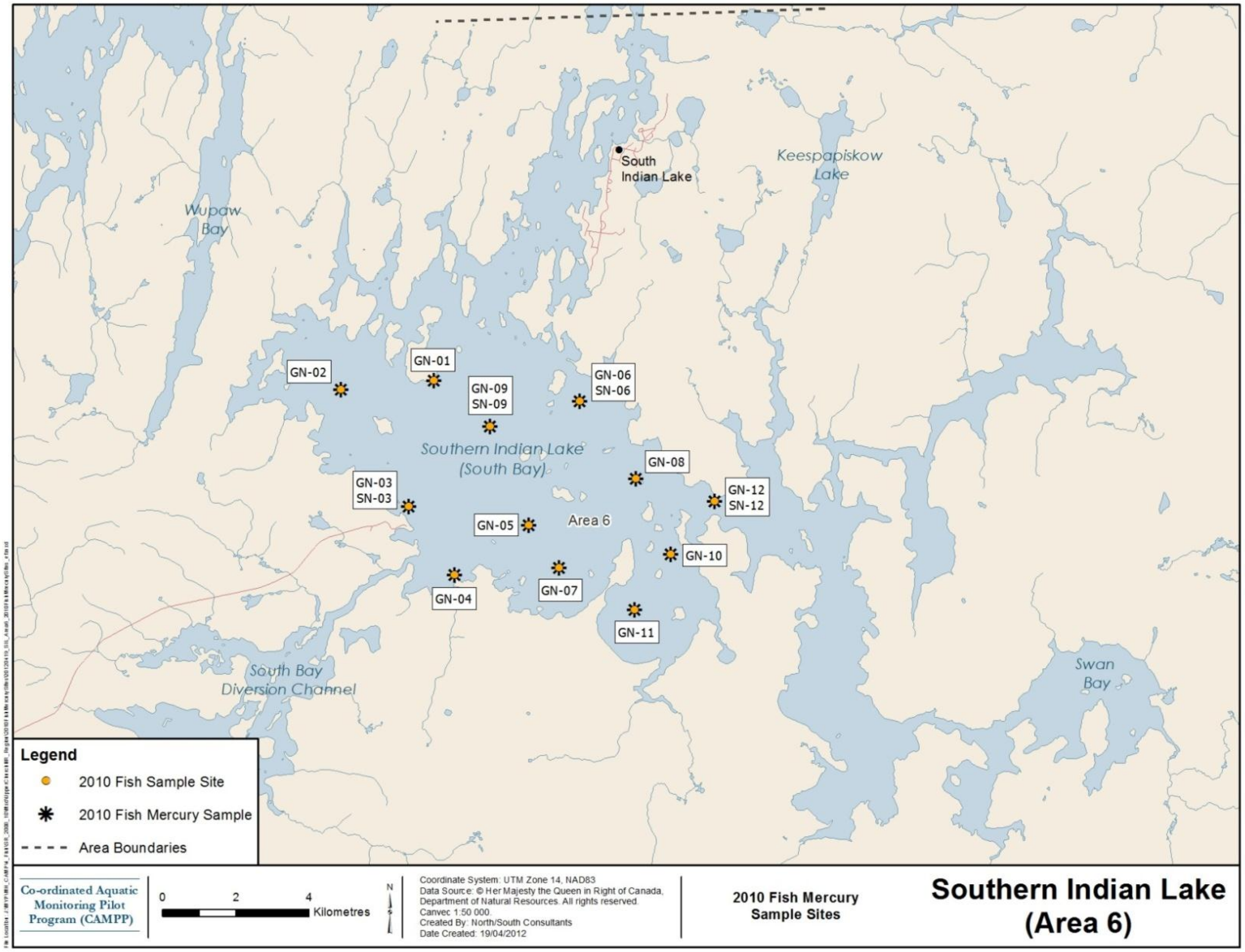


Figure 5.3.8-1. Fish sampling sites in Southern Indian Lake - Area 6, indicating those sites where fish were collected for mercury analysis.

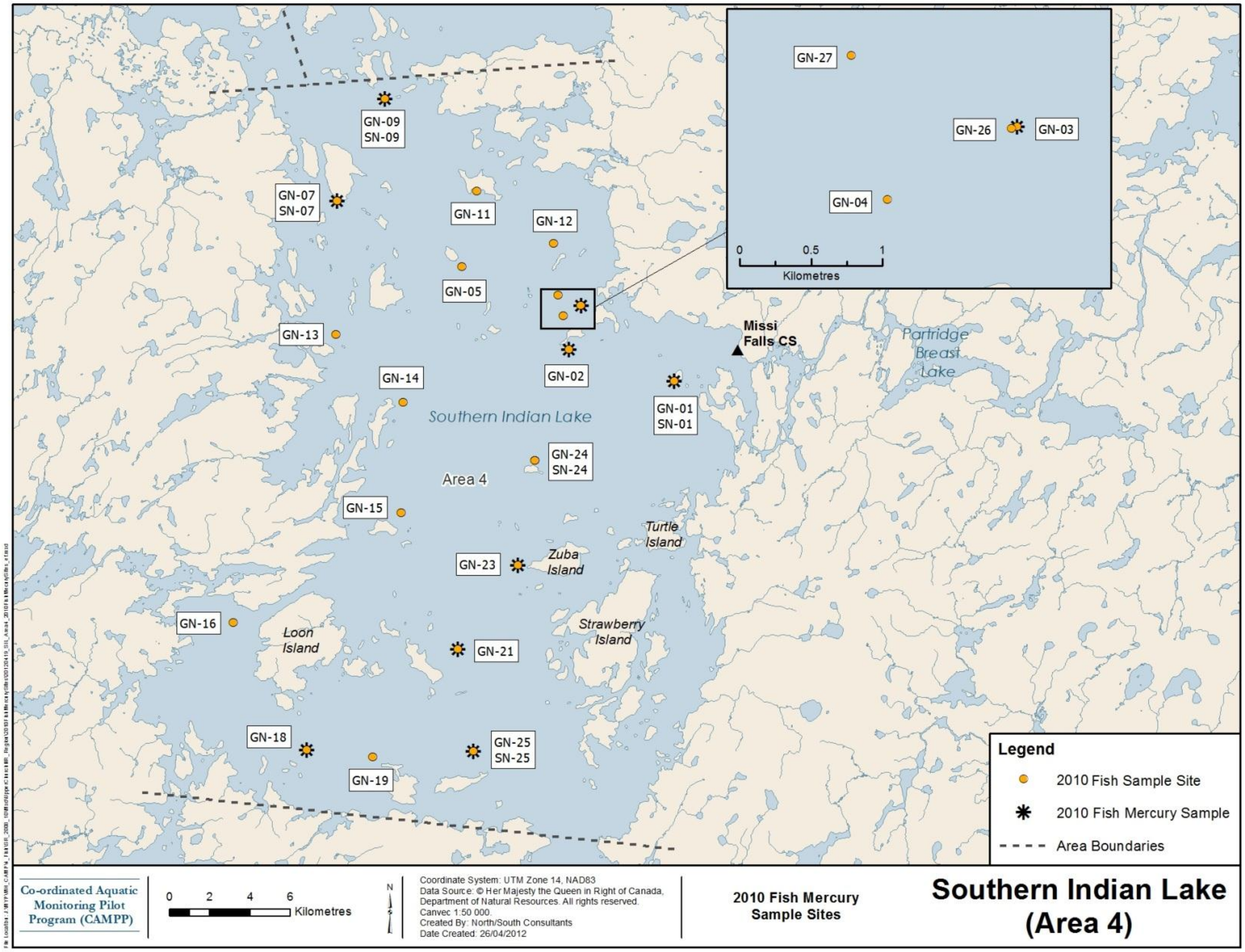


Figure 5.3.8-2. Fish sampling sites in Southern Indian Lake - Area 4, indicating those sites where fish were collected for mercury analysis.

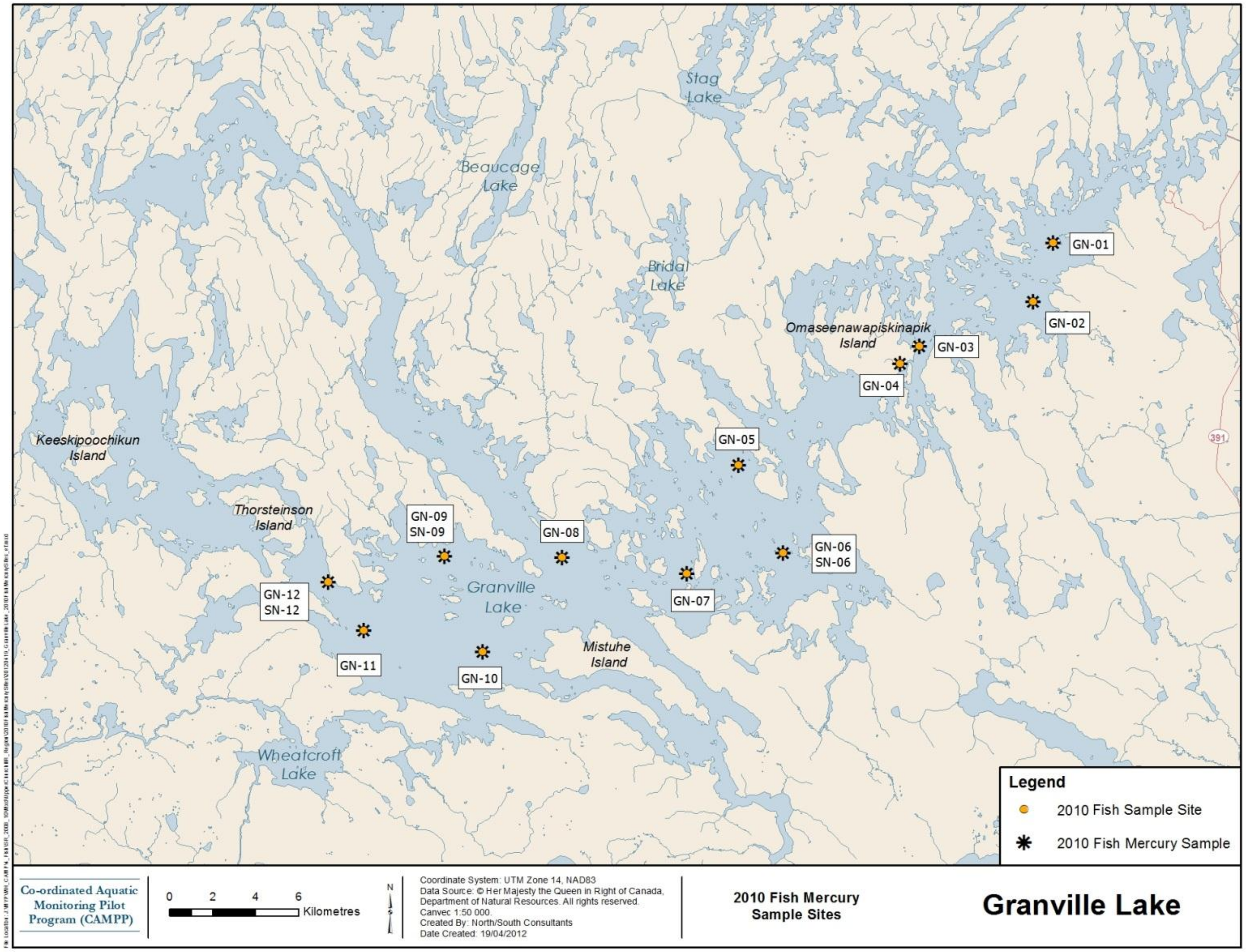


Figure 5.3.8-3. Fish sampling sites in Granville Lake, indicating those sites where fish were collected for mercury analysis.

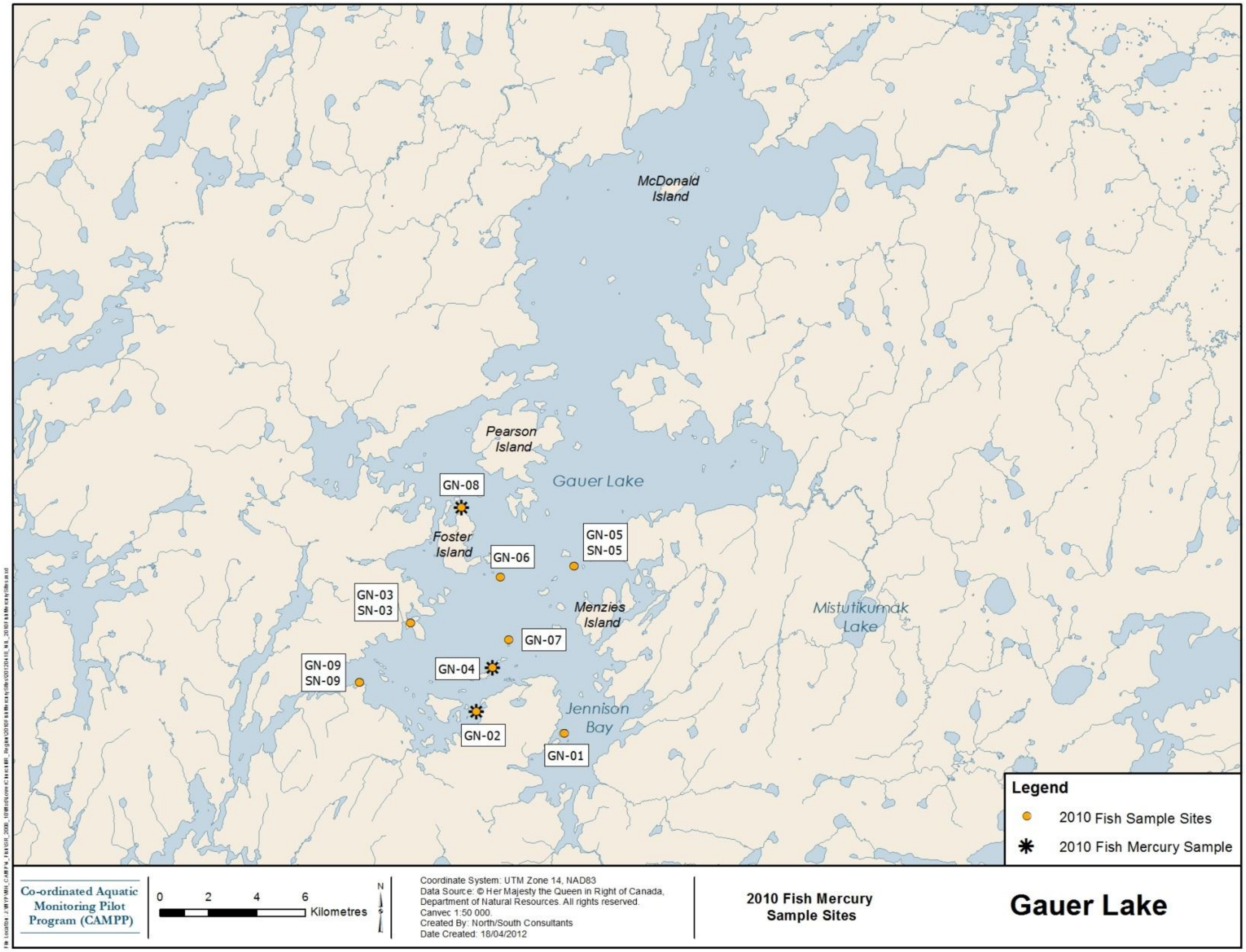


Figure 5.3.8-4. Fish sampling sites in Gauer Lake, indicating those sites where fish were collected for mercury analysis.

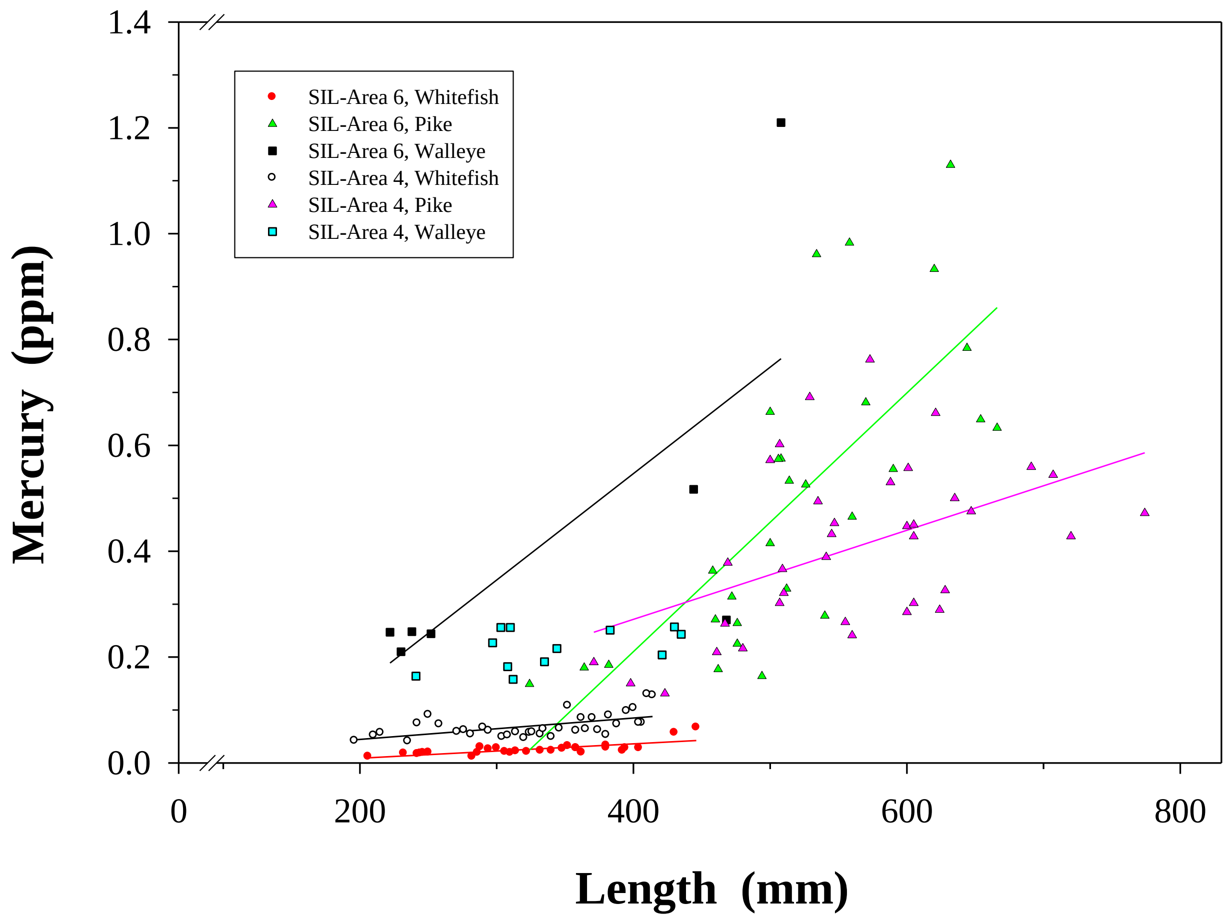


Figure 5.3.8-5. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from Areas 6 and 4 of Southern Indian Lake in 2010. Significant linear regression lines are shown.

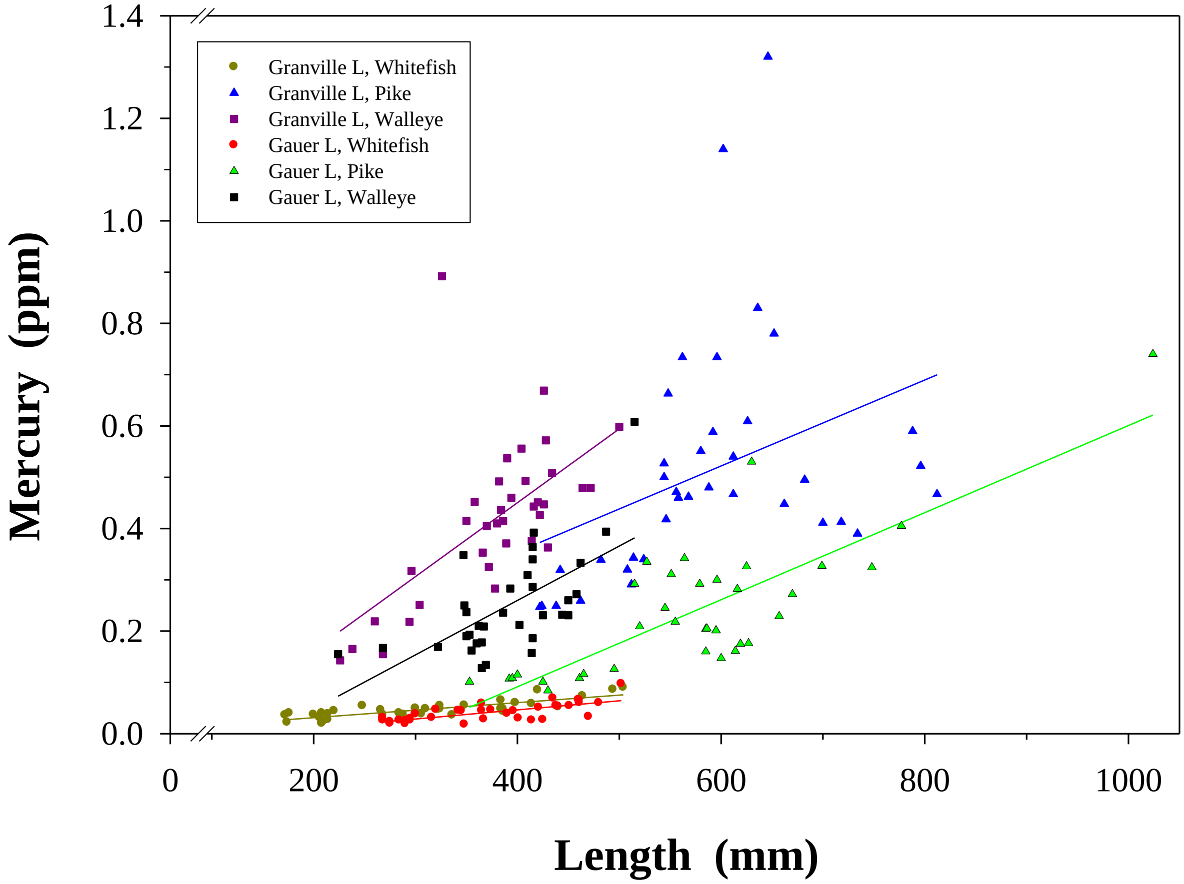


Figure 5.3.8-6. Relationship between mercury concentration and fork length for Lake Whitefish, Northern Pike, and Walleye from Granville and Gauer lakes in 2010. Significant linear regression lines are shown.

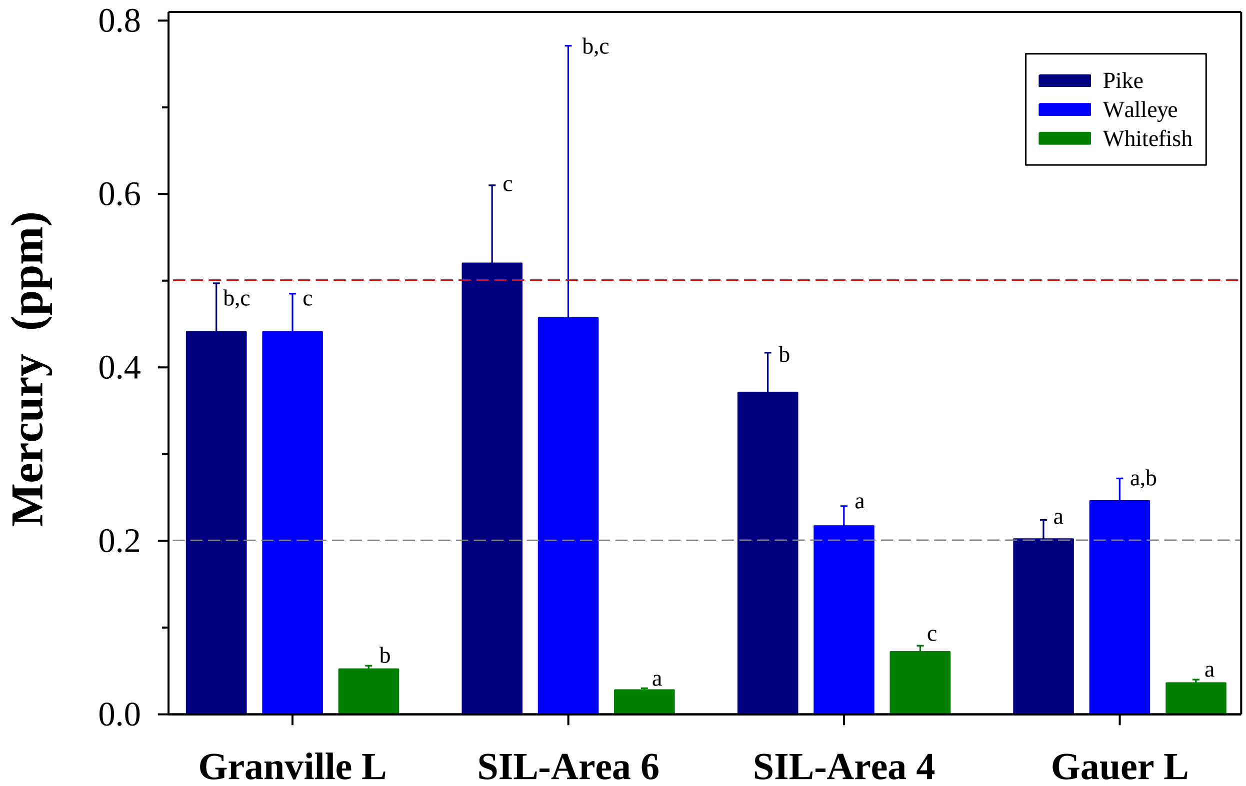


Figure 5.3.8-7. Length-standardized mean (+95% CL) muscle mercury concentrations of Northern Pike, Walleye (arithmetic mean for SIL-Area 4), and Lake Whitefish captured in the Upper Churchill River Region in 2010. Means with different superscripts indicate a significant difference between waterbodies within species. Stippled lines indicate the 0.5 ppm standard and the 0.2 ppm guideline for human consumption.